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THE CHALLENGE OF THE TEMPORAL PROCESS

PRINCIPAL MILLER LECTURES, 1936

BY

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It is only fitting that in addressing myself to the task laid upon me by the University I should begin on a personal note by expressing my sense of the honour of being invited to deliver the Principal Miller Lectures. I wish I could feel more certain that the Syndicate has been well advised in this selection of a lecturer. And it is not modesty alone that makes me doubtful. By the terms of the endowment the Principal Miller Lectures are to be on 'a subject dealing with the exposition of "The inner meaning of Human History as disclosing the one increasing purpose that runs through the ages".' Now such a definition of the aim of the lectureship suggests a conjecture which seems at least plausible. One surmises that the generous founder of the endowment not only believes, as in a broad sense I myself do, that there is one far-off Divine event to which the whole creation moves, but also cherishes the hope that objective historical study may, by laying bare the trend of human development, cast some light upon the probable nature of that grand future consummation. But if any such hope were to be realised, the task of attempting its accomplishment should obviously have been laid upon a historian and not upon one whose speciality has been the study of philosophy.

Whatever surmises may be natural, however, as to the personal anticipations of the public-spirited founder of the Lectureship, the actual terms of the endowment do not exclude the student of philosophy from making his special kind of contribution. What those terms require is only that the lectures shall be on a subject *'dealing with'* the exposition of the inner meaning of history as disclosing one dominant purpose. And one by no means unimportant way of 'dealing with' the exposition is by examining some of its necessary presuppositions. In fact, I venture to think that, in the present temper of our age, such an investigation of presuppositions is

likely to be listened to with a more tolerant attention than would be accorded to any venture to interpret particular historical developments as the onward march of some eternal purpose. Into any interpretation of that kind there would necessarily enter a large element of conjecture. Now men will listen, with varying degrees of interest, to conjectures about things the existence of which is not in doubt. But how many can spare attention for conjectures about the nature of something, the very existence of which is itself conjectural? And just this is the attitude of many minds of to-day to the idea of a goal of universal history. Why spend time in guessing at the nature of the world-purpose when one is not sure that there is any such purpose? Not so long ago the idea of Progress constituted for very many almost a religion. In the 18th and 19th centuries European thought was dominated to a remarkable extent by an optimistic faith in the perfectability of western civilisation, and in the near and certain approach of an ideal era of enlightenment and social justice. To-day the position is very different. The idea of Progress is no longer a creed but a problem. While belief in evolution is unshaken, there has been a general abandonment of the notion that its trend is automatically upwards. It is known that many types of culture and civilisation have had their hour and have perished, and the mind of the age is not closed against the possibility that a similar fate may await the type that is now dominant. Not every one feels certain that human history has any single 'inner meaning'. And even if it has, the supposition is natural that this inner meaning must be something so very inward, and so little adumbrated in the achievements of the present, that its nature must be matter for speculative reflection rather than historical research.

It is not, then, upon any excursion into the province of the historian that I invite the company of my hearers. I have already observed that one permissible way of dealing with the exposition of the inner meaning of history as disclosing an eternal purpose is by examining the presuppositions of any such exposition. That is the way which, for a short distance, I propose to follow; and I cherish the hope that in pursuing this line I may be forwarding, in my own fashion,

one of the aims by which, as I conjecture, the founder of this Lectureship was animated. To provide for the annual delivery of lectures concerned with an inner purpose of which human history is the steadily increasing fulfilment is to strike a blow against the tendency to regard the long story of humanity as merely part of a boundless *saṁsara* from which every spiritually-minded man must long to escape. It is to strike a blow on the side of a very different conception of history—the conception of it as a meaningful development, in the furtherance of which all generous spirits must be eager for a share. India to-day needs men who will be, in the finest sense, makers of history. But history will be finely made only by those who regard the temporal process as possessed of reality and as instinct with a deeply spiritual challenge. Inability to look upon it in that light has in the past done much to hinder the cause of progress in this land. It has too often led the spiritual idealism of the Indian temperament to spend itself not in a crusade for social uplift and political reform but in the quest of an Absolute that cares for none of these things. To-day in India this moral and spiritual Quietism is giving place to an Activist morality. But in all such transitions there is the danger of a reaction from one extreme to the opposite. We want no shallow type of Activism. We do not want an Activism which can see nothing in religion but a superstition or an opiate, and which in its dreams of a temporal 'better' loses sight of the eternal 'good'. On the contrary, we want a deeply religious Activism. We want an Activism which is able to combine with the strenuousness of the reformer the serenity of the sage. Is such a combination possible? In regard to the destiny of humanity can we arrive at a grounded faith that will act not as an opiate but as a tonic and a stimulant? May we rightly credit human history with a kind of inner meaning that will, at one and the same time, nourish a serenity of faith and challenge us to strenuous social endeavour? That question is the topic of these lectures.

A convenient starting-point for this discussion is offered by Tennyson's poem of 'Locksley Hall'; and for a Principal Miller Lecturer this affords a natural angle of approach, since it is a well-known line from that poem that supplies the

phraseology used in defining the scope of the Lectureship. I am inviting my hearers to search with me for a reasoned foundation for an Activist morality, and at the very outset I may be met with the objection that any such quest is a waste of time. For manly effort in the service of humanity, is not hope, I may be asked, a better tonic and stimulant than any ready-made assurance of victory? Why seek to change hope into certainty? Would not certitude of success rob all social crusaders of some of their glamour of adventure? Now I have considerable sympathy with the spirit of this criticism. Over-confidence of victory is apt to induce a slackening of effort, and to have hope changed into definite foreknowledge would be, for man, a curse and not a blessing. Nevertheless an Activist morality needs to be grounded in something more than mere hope. What more is required a consideration of Tennyson's poem may help us to realise.

'Locksley Hall' sets in effective contrast the generous optimism of youth and the disillusionment that experience can bring. The stanzas that describe an outlived enthusiasm may serve to reincarnate for us the spirit of the Religion of Progress.

> Here about the beach I wander'd, nourishing a youth sublime
> With the fairy tales of science, and the long result of Time;
>
> When the centuries behind me like a fruitful land reposed;
> When I clung to all the present for the promise that it closed:
>
> When I dipt into the future far as human eye could see;
> Saw the Vision of the world, and all the wonder that would be.
>
> Saw the heavens fill with commerce, argosies of magic sails,
> Pilots of the purple twilight, dropping down with costly bales;
>
> Heard the heavens fill with shouting, and there rain'd a ghastly dew
> From the nations' airy navies grappling in the central blue;
>
> Far along the world-wide whisper of the south-wind rushing warm,
> With the standards of the people plunging thro' the thunder-storm;
>
> Till the war-drum throbb'd no longer, and the battle-flags were furl'd
> In the Parliament of man, the Federation of the world.
>
> There the commonsense of most shall hold a fretful realm in awe
> And the kindly earth shall slumber, lapt in universal law.

One could not desire an apter picture than this of the spirit for which the idea of Progress has become a veritable religion, nerving the soul for adventure and steeling the will to endurance. But the Religion of Progress is one in which imagination and optimism have usurped the place of faith; and for

faith these are poor substitutes. Faith is a stable poise of spirit, while optimism is but a mood. With the most abrupt of transitions the poem turns from the glowing portrayal of the visions of youthful hope to the disillusionment which experience had brought.

> So I triumph'd, ere my passion sweeping thro' me left me dry,
> Left me with the palsied heart, and left me with the jaundiced eye;
>
> Eye to which all order festers, all things here are out of joint,
> Science moves, but slowly slowly, creeping on from point to point:
>
> Slowly comes a hungry people, as a lion, creeping nigher,
> Glares at one that nods and winks behind a slowly-dying fire.

Here we are shown how hope deferred has made the heart sick, and the mood of optimism has given place to anxious presage of disaster. And although the creed of the Religion of Progress is still clung to, yet now that the buoyant hope of an early fruition has departed, that creed has ceased to satisfy. For while, in one breath, the disillusioned soliloquist nerves himself to declare—

> Yet I doubt not thro' the ages one increasing purpose runs,
> And the thoughts of men are widen'd with the process of the suns.

still in the very next breath he complains—

> What is that to him that reaps not harvest of his youthful joys,
> Tho' the deep heart of existence beat for ever like a boy's?
>
> Knowledge comes, but wisdom lingers and I linger on the shore,
> And the individual withers, and the world is more and more.
>
> Knowledge comes, but wisdom lingers, and he bears a laden breast,
> Full of sad experience, moving toward the stillness of his rest.

More vividly than any words of my own could do it, the stanzas I have quoted exhibit the futility of any religion of mere Progress. They seem to me to carry in their bosom a double moral: first, that not mere hope but a reasoned faith is necessary if an Activist morality is to remain at once strenuous and serene; and, second, that even faith is not enough, no matter how well-grounded it may be, if that faith is nothing more than expectation of a victory that is immeasurably remote. The latter of these two morals will be developed in my second lecture. To-day I confine myself to the former. Recognising that mere optimistic hope is a precarious foundation for an Activist morality, I ask whether we can bring to the support of that hope a reasoned faith.

'Activist morality' is so clumsy a term as to be deservedly unfamiliar. Let me, therefore, express my question in a homelier fashion. I am asking what reflective justification we may offer for that which is happening in India to-day. We are watching a growing diversion of the spiritual force of Indian idealism from the pursuit of personal soul-culture to social and national service. Can this change of direction, I ask, be justified? With what right does the spiritually earnest young Indian of to-day reckon it a duty to toil for the betterment of social and national conditions when, if he had lived instead only a few generations ago, he would more probably have counted it a higher ethical obligation to maintain a collected poise of soul and to further his own spiritual development?

This is a question that presses for answer if we are to be proof against the doubts and discouragement that are so poignantly expressed in 'Locksley Hall'. It never can be right to waste our spiritual energy. That is too precious a possession to squander. And it *is* wasted if it is thrown away upon a cause which, in the nature of things has no chance whatever of succeeding. Now the cultivation of my own spiritual potentialities, the effort to bring my own being into tune with the Absolute—that is an undertaking the success of which may seem to lie in my own hands. It seems to be within my own competence just because it lets the world slide and concerns itself with my own character. But what shall we say of the ambitious effort to reform society and the state, and to win for humanity the ideal for which it is hungering? Is not that a mere gambler's throw—a wasteful imperilling of the precious spiritual resources of one short life in the service of a cause, the success of which at the best is infinitely remote and at the worst may be quite impossible? For science can give us no guarantee whatever that the physical universe, which holds the race of man so helplessly at its mercy, has any special tenderness for our human ideals. As a writer has pertinently observed, 'any raising or lowering of the earth's temperature, the slightest eccentric motion of a star or planet, any elevation of the ocean's surface, or any alteration of the composition of the atmosphere, would make an end of its existence; or the earth

itself may become a victim of some cosmic catastrophe, as has happened to many a heavenly body'. Why should we labour, then, at the perfecting of a social order which long before it can become perfect, may be blotted out of existence and become a forgotten incident in a cosmic process for which it never had any importance?

Very likely there are many in this audience upon whose imagination these grim possibilities produce no serious impression. They are aware, indeed, that the universe contains forces which might easily blot out the human race; but that such an event should actually happen seems to them too far-fetched a contingency to take into practical account in the shaping of daily conduct. So they will feel disposed to go on with their efforts for the perfecting of humanity, undeterred by any suggestion of the possible uselessness of these efforts, so long as this suggestion is based only upon the chance of a destruction of the earth or of its inhabitants. Now I think that the question to which this suggestion led up has too much importance to deserve to be thus easily brushed aside. Let me lead up to it, therefore, in another way. My question is of our right to expend our energies in the pursuit of an end which may perhaps be impossible, namely, the perfecting of human society. Now the chance that, long before such a goal can be reached, the earth may either be destroyed or become uninhabitable is by no means the only ground for wondering whether that goal may be incapable of attainment. We need do no more than cast a discerning eye over the course of actual human development in order to find much excuse for pessimism. In the material conditions of man's life there has certainly been extraordinary progress, but at the core of that life is there unmistakable advance? Are the men of to-day really happier than were their ancestors of a few thousand years ago? Are they more truly masters of themselves and do their lives exhibit more serenity and fulfilment? 'Society', said William James in his *Talks to Teachers*, 'has undoubtedly got to pass forward toward some newer and better equilibrium, and the distribution of wealth has doubtless slowly got to change. But to expect that such changes will make any genuine vital difference on a large scale to the lives of our descendants would be a great mistake.

The solid meaning of life is always the same eternal thing—the marriage, namely, of some unhabitual ideal, however special, with some fidelity, courage and endurance; with some man's or woman's pains'. At its core human life does not seem to alter greatly with the passage of the ages. At its core even the best of human life will always involve the reaching after an unattained ideal. And if a satisfaction resting upon completed achievement must lie permanently out of reach, ought we not to practise contentment with the incomplete rather than sacrifice our peace in futile pursuit of an ever-receding horizon? Must not the one true duty of man be self-mastery rather than social amelioration, if what can be ameliorated is never the core of human life but only its relatively superficial features? Are not those sages right who have preached not Activism but Quietism?

Arguments of the kind I have briefly indicated constitute a *prima facie* case against Activist morality which cannot be ignored. Some answer to it must be found if the idealism of the Indian temperament is to be able to throw itself into the service of the public need with a single-minded enthusiasm that is unhampered by moral misgivings.

This case against Activism could be easily brushed aside if it were permissible wholly to agree with those who deny the truth of one of its presuppositions. The argument under consideration depends upon the assumption that it can never be morally right to spend our resources, whether they be material or spiritual, upon impossible projects, and that the consequences or fruits of right conduct must therefore have something to do with its rightness. Now against this assumption it may appear easy to cite high ethical authority. One thinks at once of the Kantian doctrine that duty must be done for duty's sake alone, and of the teaching of the Bhagavadgita that detachment from all concern about the fruits of action is a condition of ideally good conduct. Such high authorities must not be lightly dismissed. If it is true without supplement or qualification that duty must be done solely for duty's sake and that we ought to set no store by the fruits of conduct, then it is enough for the social reformer to feel sure that the perfecting of society is a worthy ideal. He need not trouble himself with the question of whether

the universe may not wipe out the human race long before it reaches that ideal, or whether that ideal is even intrinsically attainable. Duty summons him to social effort, and it is not for him to pause to calculate the results of obeying that summons. The case presented against Activist morality certainly breaks down if the principle of duty for duty's sake alone expresses the whole truth about moral motive. But does it do so?

Certainly it expresses a vital part of the truth. When our human weakness makes us hesitate whether to respond to what we know to be the call of duty or to follow instead some easier course, it can never be right to make our obedience turn upon a consideration of consequences. That is morally self-evident. The imperiousness of duty is such as to brook no spirit of calculation, and it is to this imperiousness that the Kantian formula seeks to do justice. But while there can be no place for a calculation of consequences in deciding *whether* to do the right, in the very different question of *what* in particular it is right to do, such calculation is sometimes necessary, even in practice. The specific path of duty at a given time and place is by no means always self-evident, even to the sincere and morally earnest man. There may be no faltering whatever in his determination to do only the right, and yet he may sometimes feel a genuine perplexity as to what, in the circumstances, is the right way to behave. Precisely because he is in earnest about his ideals, he feels an imperative obligation to act in the manner which will most effectively promote those ideals. Therefore, utility—not selfish utility but ethical utility—is a part of the meaning of the right and good. An action can never, it is true, be right simply *because* it is useful. But at the same time no action can be right *unless* it is ethically useful—unless it promises to be more serviceable than any alternative way of acting to the ends which we have learned to count morally precious. And so consideration of circumstances and consequences cannot be ruled out of an enquiry into what in particular it is right to do, although once that enquiry is concluded, duty must be done in scorn of consequence.

If this position is conceded, then its bearing upon the question before us is clear. It seems to imply that the

principle of duty for duty's sake does not avail to nullify the case which was put forward against Activist morality. Duty always consists in behaving in the manner which, under the existing conditions, will most efficiently serve the ends which we have learned to consider truly precious. Now if one of these ends, namely, the perfecting of society, is believed to be unattainable, and therefore to be incapable of being efficiently served, it is natural to argue that duty requires us to reserve our energies for other truly precious ends that may not be unattainable. In particular it may seem obligatory to turn aside from endeavours after social uplift and political progress, and to confine ourselves to a development of our own spiritual capacities and perfecting of our inner poise of soul. Consequently the question of our right to believe in the attainableness of the goal of social endeavour has got to be faced, if there is to be any real answer to the case against Activist morality.

Indeed, Kant himself is quite able to teach us the same lesson. And not only does he recognise the need for some assurance of the attainableness of our ideals but he can also point us to the true ground of that assurance. Kant's ethical insight is far profounder than many of his critics have realised. His emphasis on the principle that duty should be done for duty's sake alone is but one part of his teaching. It belongs to his polemic against Hedonism, and not Hedonism only but any ethical system that tries to prove the rightness of the right by exhibiting it as the means to the achievement of some imagined utopia or millennium. Within the range of human experience goodness is, he insists, the only thing that is absolutely good. We human beings know the absolute good only in the form of 'the good will'. Set the moral man to make a choice between being good and achieving any utopia he can conceive, and his unbiased moral judgement will inevitably prefer the former. And therefore any ethical system that seeks to demonstrate the worth of goodness by its conduciveness to any imaginable goal of achievement whatever, is committing the fallacy of deriving the greater from the less. It is lowering the worth of goodness. Consequently duty must to the very last, retain for human intellect the form of an imperative; it must remain an authority

that does not stoop to support its commands by argument. Such is one part of Kant's teaching, and fundamentally it is sound doctrine. To say that the authority of duty does not condescend to justify itself at all may be to go too far, but it is true that it never completely justifies itself. The voice of duty always retains something of the accent of mere command. The moral man is habitually more sure of what he ought to do than of why he ought to do it; and any system of ethics which professes to deduce the specific obligations of morality from foresight of some ideal satisfaction which can be attained only by goodness falls below the level of Kant's insight into the essential nature of morality.

Yet this is only one half of his teaching. While uncompromisingly rejecting the idea that right is right *because* it is useful, he sees with equal clearness that since right *is* right, it *must* be useful. To the calculating understanding duty refuses to justify its demands, but in its accent of authority the insight of reason can detect the tone of promise. The moral consciousness can *appreciate* what the mere intellect cannot *understand*, namely, the imperiousness of duty and the supreme worth of goodness. And it cannot avoid recognising that this imperiousness would cease to be imperious, and this supreme worth of goodness would lose its worthiness, if duty were not so rooted in the nature of reality as to be invincible, and if goodness were not the phenomenon of a good absolute that is more than mere goodness. Goodness is the only form in which good absolute is knowable by man, but it does not follow that it is the only form in which good can be absolute.

Let us explore this matter a little for ourselves. Every man of social sympathies must feel the facts of life constantly challenging him to an Activist morality. Around him he sees endless examples of social injustice and heartless abuses, unequal distribution of wealth and privilege, tyranny of rank and office, practical denial of the elementary rights of manhood. These things are clearly evil. Is not their evilness justification enough for rising to fight them? Must we wait for an assurance that the battle will be victorious? Surely it is nobler to spend one's life in a losing contest with social evils than in a supine acquiescence! Surely it must be right,

and our bounden duty, to fight wrong, even if wrong be invincible!

To this attitude of moral heroism which scorns to calculate the odds it is difficult not to accord a tribute of approval and admiration. And yet there is a reflection which must give us pause. There is a question which the thoughtful mind cannot permanently escape, and which makes one wonder whether such moral heroism is truly heroic—whether, perchance, it is not impertinence rather than heroism.

Suppose, at least for argument's sake, that wrong *is* invincible. What then? What would its invincibleness imply? What inference regarding the nature of things should we rightly be constrained to draw from its invincibleness? Surely this, that what we human beings regard as wrong and evil is rooted in the nature of things and reflects the inner character of the real. And hard upon the heels of this conclusion there would tread another, namely, that those ideas of the right and good in the light of which social abuses seem so wrong and evil are merely human ideas, notions characteristic of those pygmy denizens of one particular planet whom we designate the human race. And is it, after all, so very noble and heroic of these pygmies to presume to condemn as wrong and evil the very nature of things and to range themselves in battle against the universe? Monkeys have, no less than men, preferences and dislikes which are characteristic of their simian nature. If a monkey were to take up the heroic attitude, and to resolve that, reckless of the odds, it would fight the universe in the effort to make monkey ideals prevail, we should deem its valour not heroic but ridiculous. And must we not, in mere consistency, pass the same judgement in the human case if the human case is similar? If man's ideas of right and wrong are nothing more than the preferences and dislikes characteristic of a particular terrestrial species of living beings, is it not arrogance rather than dutifulness to cry, Let these ideas be fought for though the heavens fall? That is a pertinent enquiry which there is no way of blinking. The augustness of duty depends upon a faith that duty has a cosmic significance and is no affair of merely human judgement. Doubtless the specific opinions about right and wrong that may be current in

any particular age are very human achievements of thought. They may be quite as imperfect, and quite as relative to temporary social and economic conditions, as historical research suggests. But the right and wrong itself, *about* which men have these imperfect and relative ideas, need not be therefore something purely human and adventitious. For duty could not exhibit that severe grandeur which even our dull moral vision cannot wholly fail to appreciate, if it meant merely what the individual, or his community, or even the entire human race approves of. The right could not shine with that austere glory which every true heart acknowledges, if our imperfect ideas about it were not partial apprehensions of something which has behind it the whole nature of things and which expresses the inmost being of reality. Duty must be done for duty's sake; but duty would cease to be itself if it were not so grounded in the real as to carry the sure promise of victory.

Does this, perhaps, appear a trifling conclusion to have spent so many words in reaching? It is easy to under-rate its importance. For one may contemptuously remark that it only consists in saying to the moral Activist that while we cannot afford him scientific or historical grounds for an opinion as to whether, how, or when the goal of a perfected social order will be attained, we can assure him that so long as he remains convinced of the real goodness of that goal, he is logically warranted in believing it certain of ultimate achievement. Nevertheless the contempt expressed in such a remark would be quite mistaken. Our conclusion has all the importance of changing hope into faith by linking it with what is the deepest and most inexpugnable feature of human nature—man's moral consciousness. No man can rid himself of the recognition of a moral imperative. He may be an ethical heretic. He may deny the soundness of the currently accepted moral code and flout contemporary ideas of duty as mere conventions. But when he does so, he cannot help regarding this act of denial and rejection as what he *ought* to do—what he would despise himself for not doing. Or, at the least, he cannot help regarding it as truly better to hold and utter these unorthodox convictions than to go with the throng. So, when he imagines that he is denying

the right and the good, in fact he is only expressing a different opinion as to *what* is truly right and good—*what* is truly better or worse. From recognition of *a* right and *a* good he cannot break away. And to this moral attitude, from which human nature cannot wholly withdraw even when it tries, we have shown that there is logically united a faith that what is truly right and good must have the whole universe on its side. Of a certainty that conclusion, if correct, does not lack importance.

There is another form in which the conclusion at which we have arrived may be expressed. We may express it by saying that there is at least one way in which cosmic history does disclose an inner meaning and an immanent purpose. It begins to surrender its secret when, in the course of time, it evolves the human moral consciousness. And it makes the revelation to the moral reason rather than to the scientific understanding. We have realised that it is the nature of duty to utter its demand with an imperiousness which the calculating intellect cannot justify but which the intuition of reason can appreciate. And we have recognised that this majestic imperiousness, which shines out for the eye of reason so impressively, must be a delusive appearance if duty expresses only the conscience of man and not also the immanent purpose of the real. This is why we have an intellectual right to be just as certain of the victory of the good as we are certain of its goodness. He who is fighting for what he knows to be right and good may exchange mere hope for faith. He may pass on from mere natural optimism to a morally grounded certitude. We mortals can appreciate the goodness of the good much better than we can understand it; we know that nothing can be truly good which rests upon mere human preference and is not grounded in the nature of the real; and therefore the degree of our certainty of the true goodness of what we long for gives the measure of our right to be sure that on the side of its accomplishment there are ranged the deepest forces of the universe.

With the establishment of this position there is ended the first stage of the undertaking proposed for these lectures. We have learned where to look for the foundation of that serenity which a worthy moral Activism should display. But there is

much more to be attempted. We naturally wish to delimit more precisely the nature of the confidence of victory which sustains this serenity. We require to consider how it is protected from the impatience and discouragement to which the remoteness of the anticipated achievement is apt to give rise. That is to say, we need to study the true relation between a temporal 'better' and the eternal 'good'. And we must take cognisance of that element of contingency in the temporal process which challenges us to combine with the serenity of the sage the passion of the moral crusader. Such topics, however, must be reserved for treatment, so far as opportunity serves, in the second of these lectures.

THE CHALLENGE OF THE TEMPORAL PROCESS

Lecture II

In the first of these lectures on 'The Challenge of the Temporal Process' I followed the lead given to philosophical thought by Immanuel Kant in treating moral insight as the faculty that affords to man his most penetrating glimpse into the nature of the real. Moral insight is not, indeed,—any more than other kinds of intuition—beyond the bar of critical judgement. But the criticism has to be immanent criticism—a testing of conscience by its own light. The 'categorical imperative' of duty, Kant suggestively maintains, is at once the most astonishing, the most self-certifying, and metaphysically the most illuminating element of our common human experience. *It is astonishing.* For how can a short-sighted, impulse-ridden creature of a day like man have knowledge of, or even be able to imagine, an eternal, universal and absolute obligation? *It is self-certifying.* For when conscience is really awake, it speaks with a majestic authority, before which all doubt shrivels up, and we *know* that we are in the presence of an absolute right and good. And this astonishing, but self-certifying, categorical imperative *is metaphysically illuminating.* For by that augustness of majesty which is too self-evident for honest doubt,

duty betrays the transcendent nature of its sources. It shows that good is the concern not of many only but of the universe.

> 'The Good, the True, the Pure, the Just—
> 'Take the charm "For ever" from them, and they crumbled into dust'.

Yes, Tennyson is right so far. When the 'For ever' is denied, the goodness of the good begins to be dubious. But the good refuses to remain in doubt. It is too convincingly alive for that. And in recapturing credence, it reasserts its participation in the eternal and absolute. They who sacrifice all for duty and the good are conscious that in being loyal to what is highest in themselves, they are being loyal also to what is deepest in the eternal nature of the real. So they wage their battle for the good in the faith that reality is their ally.

Such was the position argued in the former lecture. It was formulated as the principle that the degree of our certainty of the true goodness of what we long for gives the measure of our right to be sure that the deepest forces of the universe are behind it. That is a formula, however, which obviously stands in need of clarification. There is an ominous note in the phrase, 'the degree of our certainty of the true goodness of what we long for'. The pictures of what we long for always draw upon the colours of the imagination, and imagination can, and does, paint falsely. Must not this fact gravely diminish the certainty of our belief in the goodness of what is pictured? At another point also the formula supplied by the previous lecture lacks precision. What exactly is meant by the claim that on the side of the victory of the good there are ranged the deepest forces of the universe? This may pass muster as poetic metaphor, but the intellect hankers after the sobriety of prose. It will be convenient to consider first this second question.

I will say at once that I am not intending to suggest any rigid predetermination of the historical process. Bergson has justly reminded us that fate is equally fate, whether the factor which necessitates the events of the present lies behind or in front. It has been my thesis that what the temporal process challenges us to is an adventure of faith, and were I so foolish as to support this thesis by teaching that the victory

of a definitely conceived good was certain, I should be substituting foresight for faith, and robbing the moral adventure of its venturesomeness.

Having stated what I do *not* mean to suggest, I will next indicate in a preliminary way the view I *do* intend to advocate. The simplest method, perhaps, is by recalling a Biblical incident narrated in the Gospel of St. John. In my judgement the most significant feature of the incident is the contrast between the instinctive mental reactions of Jesus and of his disciples. We are told how, in one of their wanderings, the little band of comrades fell in with a man who had never enjoyed the blessing of eyesight. The spectacle of so dread calamity as blindness from birth at once set the disciples' minds hunting for an adequate *cause* in the past. With equal instinctiveness the mind of Jesus searched instead for an adequate Divine *purpose*. The disciples suggested that the cause must be looked for in some pre-natal fault either of the man himself or of his parents. In effect the reply of Jesus was: 'There is no need to tax our brains to conjecture the cause. For, whatever the cause may have been, one thing is certain. The Heavenly Father would not have permitted the man to have been born blind unless it had been in order to challenge him and us to win from that evil some good which was worth such a cost, and which could be had in no other way'. And Jesus' practical solution of the problem was to recognise in that evil an invitation to make such an exercise of his gift of healing by the power of faith as would win for the sufferer and his friends a quickening of their spiritual insight—a new apprehension of how readily the Heavenly Father responds to the appeal of believing trust.

The moral of this story is one which I believe that we may rightly generalise. There are but few who have acquired the grace of being able to bestow healing by faith, but none is so poor as not to possess any gift which he can, by faith, apply to the task of trying to bring good out of evil. And the philosophical value of the story is that it suggests two convictions in the strength of which this task may be undertaken. The first is that interpretation by purposes goes metaphyscially deeper than interpretation by causes. And the second conviction concerns the sense in which it is true that

on the side of the victory of the good there are ranged the deepest forces of the universe. They are not so ranged as to exclude the occurrence of the evil and the wicked. But good belongs so fundamentally to the essence of the real that there cannot possibly enter the temporal process any evil which is not capable, by the spirit and manner in which it can be faced and dealt with, of being converted into the purchase-price of some surpassing good.

The philosophical suggestion which I find in the incident to which I have referred is, I believe, profoundly true. It implies no crudely Deistic interpretation of the idea of 'Providence'. Neither does it involve a rigid predetermination of the course of events. While teaching that the transmutation of evil into good is always obtainable, it does not presume to predict either the particular nature of this good or the cost at which it is to be won. I am anxious that my own reasons for recognising in the temporal process an element of the indeterminate should not be misunderstood.

In popular thought the commonest ground for repudiating determinism is the belief that it is incompatible with moral effort. It is supposed that if the course of events were so timelessly determinate as to leave no room for the least flicker of contingency anywhere, then moral struggle would be useless; for, whether we struggle or make no effort, the outcome must be the same. But this is mere confusion of thought, due to mixing up together the temporal and the timeless points of view. If every step of the causal process is infallibly determined by the step before it, then the question of whether the next step is or is not to contain any energy of moral struggle must make a real difference to the subsequent steps. And if there is nevertheless, from the timeless point of view, no uncertainty about the nature of the outcome, this is only because from the timeless point of view there is also no uncertainty about the degree of moral effort characterising the steps leading to that outcome.

Clearly we need not let ethical apprehensions that are based upon so crude a confusion of thought hinder us from approaching with an unprejudiced judgement the question of the determinateness of the temporal process. I do not think it is worth while to spend much time in discussing the

idea of a merely mechanical determination—the idea that the present is completely determined by the mere past. That is a bogey which we may regard as definitely laid, and it would be wearisome to thrash out once again the old arguments with any fulness. The claim of the older Determinism was that every occurrence without exception, whether it be an external event or a human volition, must be entirely the product of its temporal antecedents. This claim we may now-a-days, I think, quietly set aside as definitely disproved—disproved not in respect of human actions alone but in a quite general reference. For, to speak of 'occurrences' is to speak in terms of time; and when a whole is spread out in time, what is needed in order to exhibit each stage of its sequence as determinate or deducible is not its past alone, but its past and its future together. When we seek to understand phenomena in space, we are not content to explain the movement of a particle by considering only the influence of the other particles to the right of it, ignoring those to the left, or the influence of those above it, ignoring those below. Why, then, should we be less exacting in our demands for the explanation of phenomena in time? Some one may reply that the reason is obvious. The particles in front of an object in space are as real as those behind, whereas in time the future is unreal. Well, the future is certainly unreal in the sense of non-existent, but that kind of unreality belongs to the past as well. And the suggestion that, in spite of its non-existence, the future may conceivably possess, as much as the past does, the kind of reality that enables it to influence the nature of the present is just the point under discussion; to take for granted a negative answer would be to beg the question. When we are thinking in terms of mechanical causality, according to which the past is regarded as just now acting upon the present, and as therefore implicitly simultaneous with the present, we are treating time as a kind of space. And so we must conform to the demands of spiritual explanation to the extent of considering the present not to be fully determinable unless by the past and the future together. Only to the degree in which any particular object of investigation may be usefully treated as so undeveloping or lifeless as to be theoretically detachable from the

time-process, can we venture to treat its present as though it were wholly explicable by its past, or to predict its future from its present.

I feel no difficulty whatever, therefore, about admitting a degree of indetermination of the present in relation to the past. Difficulty and consequent hesitancy begin, I think, only when we turn to consider the relation of present occurrence not to the temporal past or the temporal future but to a super-temporal Whole. For whenever we venture on the concept of the super-temporal, we are in water so deep that if we have still any touch with the solid ground of experience, it is only by the tips of the toes, as it were. Even here, however, the drift of my own thinking is not in a Determinist direction.

By the super-temporal I do not mean the time-less. The purely time-less must neither change nor last, for both change and lastingness are features of the temporal; and what neither lasts nor changes must be unreal. The scientific mind used to make much play with the time-less by substituting for the popular notion of real causes which take time to act the idea of time-less laws of change. To-day, on the other hand, science has developed the new concept of 'space-time', and with this weighty encouragement to treat time with respectful seriousness, I think I may safely brush aside the time-less as the unreal. By the super-temporal, then, I mean something of which our human time-experience is, to be sure, only a very imperfect expression but which is not expressed at all by the time-less. Certain features of our human time may, perhaps, help us dimly to divine the nature of the super-temporal, but too vaguely and conjecturally to provide any safe basis for inferences. Accordingly, if we are to consider the relation between the present occurrence and a super-temporal Whole, we must not seek to deduce conclusions from our idea of super-temporality but must fall back upon general postulates of reason.

By a postulate of reason I mean any principle that is so much a part of the very nature of thought that without employing it we cannot reason at all. Can we invoke any such postulate of reason to settle the question of the relation between the super-temporal and the events of the time-process? Does any such postulate rule out all contingency, and require

that nothing whatever shall be accepted in the end as mere fact, insusceptible of explanation? I am constrained to answer in the negative.

It is true that the orderliness and goodness of reality seems to be an ultimate postulate. When we have before us two rival theories, we instinctively adopt as the truer hypothesis that which reduces to a more coherent system all the data that we can experimentally accumulate. And this means that it is a rooted presupposition of intelligent thinking that the real must be perfectly systematic or orderly. Again, when we study the mind's way of working, we cannot but notice that what we instinctively demand an explanation for is the bad rather than the good. To cite a crude example, far more people are sceptical about the existence of Hell than of Heaven. That there should be a Heaven seems natural, but a Hell demands explanation. And it is not to our desires alone but to our thought that it seems natural. For the good has, in its own goodness, a sufficient reason for its existence, while the badness of the evil furnishes so excellent a reason why it should not exist as to render the fact of its existence a subject of perplexed enquiry. Indeed, it takes little acquaintance with the history of thought to discover how uniformly philosophy has consisted in the mind's endeavour to satisfy itself that, in spite of apparent disorder and evil, reality is essentially a realm of order and goodness.

Granted, however, that we have here identified an inevitable presupposition of all thinking, we have still to ask just how far this presupposition takes us. It lays down certain limiting conditions but it does not prescribe how these conditions must be fulfilled. Reality must be orderly or systematic. True! But different systems are conceivable, and each of them, if genuinely systematic, must be perfectly orderly. And again, reality must be good; but there may be more than one way of being good. Theoretically many systems of being are possible, equally orderly and equally good. Reality cannot be all of these at once. Why, then, is it one and not another? Is that an answerable question? Or have we here reached a point where we have to be satisfied with mere contingency, mere ultimate fact insusceptible of further explanation?

The reply seems to be that the question is not answerable, but that the reason why it is unanswerable is because it is absurd. We are talking, let us remember, of a question that is being asked about what is supposed to be an all-inclusive good order. Outside of it there is nothing, for it is co-extensive with the real. And the question commits the absurdity of going outside all that is real, and into the circumambient expanse of nothingness, in order to seek there a ground determining the real to be what it is! That no answer is forthcoming to a self-contradictory question implies no blemish in the rationality of the real. But it does imply that there is a point where explanation stops and where reason has to accept mere fact. It is true that in the supposed all-inclusive system of the real there is no single element that could be altered without marring its orderliness and goodness. But while no *single* element is alterable without that penalty, it does not follow that if, together with a change at one point, there were compensatory change at another point or other points, there would not result a system equally good and orderly but yet different. Now this possibility, which no rational postulate excludes, represents, I believe, the actual position. Reality must be eternally orderly and good, but this eternal necessity of order and goodness does not suffice to render either predictable or determinate the course which the time-process will follow. It only excludes the possibility of any development which cannot be so supplemented by other compensatory developments as to maintain the orderliness and goodness of the real.

It is now time to apply to the special problem of these lectures the conclusion to which this argument has led us regarding the degree of contingency that characterises the temporal process. In the first place, that conclusion is calculated to restore to the social crusader the spirit of adventure which he would be despoiled of by a belief that the course of history was rigidly predetermined. It serves to keep moral Activism strenuous by showing that the struggle for social causes is a real battle, the course of which is really uncertain and depends in part on the warrior's own energy and faithfulness. Indeed it may, perhaps, be suspected that the conclusion which we have adduced in the service of our purpose

goes too far for our purpose, by promoting strenuousness at the cost of serenity. It may appear to do this in two ways.

One is by failing to protect against the impatience and despondency born of hope deferred. The belief that 'through the ages one increasing purpose runs' does not prevent the soliloquist of 'Locksley Hall' from adding discontentedly, 'What is that to him that reaps not harvest of his youthful joys?' Now there is no certainty whatever that the harvest of the hopes of the social reformer will be reaped in his own life-time, or indeed in many life-times. The element of contingency in the historical process renders not only unpredictable, but actually indeterminate, the time when and the cost at which the battle will be won. And experience tends to beget a doubt whether the fulfilment of hope will ever be complete or the wearisome struggle ever be finally ended. So it may seem as if the goodness of the real which of rational necessity we must postulate were a curious kind of goodness; it may perhaps be goodness in the eyes of some superior intelligence, but for our human apprehension it seems a heartlessness that makes of man's social endeavour a pursuit of the rainbow, which recedes as fast as the pursuer advances. But if this were so, then the result would be something worse than a mood of impatient despondency. Not merely would moral Activism lose its serenity but it would be involved in contradiction with itself. For the duty of social endeavour would in that case come into conflict with the moral principle which was emphasized in the previous lecture—the principle that it can never be right to waste our spiritual resources by expending them on the pursuit of the unattainable. There was a measure of truth in the old Cyrenaic teaching that morality must consist in making the most of the present. For the future never arrives. What arrives is always a new present. So a morality of which the objective is nothing but an ever-receding horizon is a futile and therefore bad morality. A good which never is, but wholly is to be, can supply no true foundation for the imperative of duty.

There is a second way in which the contingency of the historical process may threaten to disturb the serenity of the moral Activist. For what may seem to be contingent and

uncertain is not only the time when, and the cost at which, the particular ends we strive for will be attained. Their attainment at all may seem dubious. The postulate of reason that reality must be good as well as orderly does not define its kind of goodness. It does not of itself exclude the occurrence of serious evils; it does not of itself exclude such a disaster as the frustration of some particular good cause; it only teaches that out of all evils and disasters it is possible to win a compensating good that will maintain the goodness of the real as a whole. But can an assurance of that kind satisfy the social reformer? What he is labouring for is not the good in general but some particular project of social betterment which appears to him worth the utmost sacrifices. Can we expect this moral Activism to remain always serene if it is haunted by the spectre of a possible complete frustration of the special end to which he has devoted his life?

Where the postulate of the goodness of the real fails him by leaving too much room for contingency, it may be thought that he can fall back upon that other principle which was discussed in the first of these lectures—the principle that the degree of our certainty of the true goodness of what we long for gives the measure of our right to be sure that the deepest forces of the universe are behind it. But in the statement of this principle there occurs, as has been already remarked, a disquieting phrase—'the degree of our certainty'. Have we really any right to be certain of the true goodness of what we long for? Is it not notorious how generally the successful fulfilment of human dreams proves disappointing? What imagination had pictured as ideally satisfying turns out, upon achievement, to be sadly imperfect. Must it not, then, be regretfully admitted that our confidence in the victory of the causes we struggle for must be weak indeed if it has no right to be stronger than our belief in the correctness of our conceptions of the ideally good?

We have thus indicated two points at which the serenity which ought to characterise an ideal Activist morality is liable to be upset. It seems likely to be assailed by a mood of depression and impatience induced by the remoteness of the victory that is hoped for. And it seems in danger also of

being undermined by doubt regarding the real goodness of the ends pursued—doubt whether they are so truly good as of necessity to have behind them the deepest forces of the universe. I have set these two points together because I am persuaded that, in respect of both, the way of escape is to be looked for in one and the same direction. Both types of difficulty are surmounted in principle when it is realised that true morality has its centre of gravity not in the future but in the present.

Concern with progress and improvement is not the primary interest of the moral consciousness but a secondary or derived interest. This may seem a startling assertion but reflection will sustain it. It is true that in some cases the moral man bases his decision that a particular endeavour is right simply on a perception that what it will achieve is a little better than what would result from any other practicable course that has occurred to his mind. He says to himself that it is wrong to pursue the unattainable, and that as between the practicable alternatives he is so perplexed that all he can see is that one is a little better than the others. But such a case is typical not of the intrinsic nature of moral judgement but of the imperfection of its actual practice in certain types of cases. And even when an individual's moral decision takes this form, his distinctively moral interest in his act is in it not as a choice of the merely better but as a doing of the absolutely right; for it is absolutely right, when one has no practical choice except between the worse and what is a little better, to choose the latter. I must repeat, however, that a moral decision which reflects itself adequately in nothing more than the judgement, 'This action is right because its object is better than that of any practicable alternative', is an example of the failure rather than of the intrinsic nature of moral deliberation. In a really thorough and completed process of moral deliberation the judgement and the action preferred is 'better' than any other is simply an abstract summing up of the outcome of an appraisal which has been worked out by other intellectual methods than mere qualitative or quantitative comparison. A careful analysis of the difference between the procedure of moral judgement in customary and in reflective or self-conscious morality would show, I believe,

that what is aimed at in the latter is such an interpretation and integration of purposes as shall exhibit all accepted purposes as individuations of a concrete universal.

Primarily, then, the concern of morality is not with progress toward a 'better' but with a present right and good. Nevertheless in a derivative or secondary way morality is deeply concerned with progress and improvement. How is that? It is because the objects which call forth the present devotion of the moral man are of such a kind that he cannot be loyal to their present worth without seeking to develop them along their line of growth and promise. Why does the good man count it a duty to toil for the uplift of humanity, for the betterment of its conditions of existence and the perfecting of its institutions? It is because he is experimentally aware of a worth in humanity, as organized under its current institutions, which is worthy of being conserved, and because this worth is of such a kind that only in one way can it be conserved, namely, by an unresting attempt to develop it further. We can be loyal to its worthiness only by reaching out after new achievements, in the realm of thought, of conduct, and of institutions, such as will express more adequately those ideal loyalties, the present expressions of which render life in fellowship with others an experience of undeniable worth. What is primary in morality is loyalty to experienced values, and it is because, under time-conditions, these values can remain real only through constant development, that aspiration after the unattained becomes so prominent a feature of human moral activity.

It should not be difficult to see the bearing of this contention upon the two points at which, as we realised, reflection on the contingency of the temporal process is apt to impair the serenity of an Activist morality. The first consideration was that recognition of how remote is likely to be the victory that is being striven for may easily induce a mood of impatience and despondency. Now this result would be inevitable if morality were, primarily and fundamentally, devotion to nothing less than an ideal of consummated achievement. If the present were felt to have no goodness except in so far as it was an approximation to an ideal 'best', then the infinite remoteness of that 'best' would mean that the present

was no real approximation and so had no value at all. But in actual fact, as we have argued, the position is quite the contrary. We do not care for the present 'good' only because, and only in so far as, it seems a weak foretaste of a future 'best', but it is through our appreciation of present 'good' that we learn to long for a 'better' and a 'best'. Our moral effort to better the present springs out of a loyalty to its existent half-developed values, a loyalty which can learn to wait patiently for an ever better and better because the present values, despite their immaturity, are already so good. In this way the rootedness of morality in the present disposes in principle of the first of the two obstacles to serene moral activity.

It also disposes of the second. For, just as we do not *care for* the present 'good' only because it is a weak foretaste of a future 'best', so we do not *discover* what is good only by comparing present fact with our conception of an ideal 'best', but we divine the 'best' by reflection on present 'good'. Moral judgement is not typically an estimation of the actual by its power of contributing to a perfect imagined future, but is an act of thought which, out of an insight into present good, derives a conclusion as to how its known goodness demands to be further developed. Being the latter, it rests upon the bed-rock of experience, while if it had been the former, the untrustworthiness of our conceptions of the perfect would have rendered dubious all our present judgements of value. Now the fact that the case is so disposes in principle, as I have said, of the second of the two obstacles to a serenity of moral effort. We do not need to be too troubled by thought of the part which imagination plays in constructing our ideals of social reform and national uplift. The degree in which they are built up by the imagination certainly means that in form they are untrustworthy. And since we cannot be sure that, in the form under which we imagine them, these ideals are truly good, we have no right to the faith that the deepest forces of the universe must be on the side of their accomplishment in that form. But if it be true, as I have contended, that the substance which imagination works up into that form is drawn from our experience of undeniable present good, then we may be sure that our visions of social

regeneration have within them, in spite of all their superficial mistakenness, the substance of truth, and that to the achievement of that solid core of their promise the eternal nature of reality is pledged.

I have now completed, to the extent that the limits of time and ability permitted, my defence of the thesis that the temporal process challenges us to a moral Activism, at once serene and strenuous. It would have been easy to construct a more convincing case, had I felt free to deal with the temporal process not as abstractly considered but as interpreted by positive, and especially by Christian religious experience. But even without that aid, I hope I have shown man's right to a moral faith that can nerve him for social effort, and that can help him to see in all sorrows but

> 'the tension thrills
> 'Of that serene endeavour
> 'Which yields to God for ever and for ever
> 'The joy that is more ancient than the hills'.

THE PROBLEM OF RURAL INDEBTEDNESS

BY

PROFESSOR P. J. THOMAS

" At every draught more large and large they grow
A bloated mass of rank unwieldy woe."

—GOLDSMITH

Always in the front rank of India's economic problems, rural indebtedness is today one of the most pressing of them, owing chiefly to the added burden resulting from the phenomenal fall of prices since 1929. The agricultural population had long been groaning under a heavy load of debt, and today the burden is much heavier. Unless it is greatly lightened, any widespread agricultural improvement will be difficult, the standard of living will remain low, and rural backwardness is bound to persist. The agricultural classes form more than 70 per cent of the population, and unless their income increases, consumption would be meagre and the home market would remain undeveloped; and that would be a serious barrier to industrial advancement. Thus the problem is really pivotal; whether we view it from the viewpoint of immediate relief to those stricken by the trade depression, or from the viewpoint of initiating a new economic policy of planned development, rural indebtedness is the one problem staring us in the face, and there is no getting behind it. It must be tackled if any serious scheme of economic reconstruction is to be put through in this country.

Elsewhere in the world, especially in the 'new' countries of America, where agriculture is more or less capitalistic, agricultural indebtedness is rather a modern problem arising from the sudden slump in prices, but in India, it is an old problem, a chronic disease which cannot be remedied by any measure of immediate relief. It touches the fundamentals of Indian economic life, and its real causes must be analysed in order to be able to prescribe any suitable remedy for it. In this paper, the general problem will be first dealt with, and then will

follow the special problem that has arisen by the Economic Depression.

The Causes of Indebtedness

The peculiar feature which marks out India's agricultural indebtedness from that of other countries is that it is chiefly due to unproductive expenditure. Whilst in the United States, the great bulk of farmers' borrowings are for productive purposes, and only a small percentage for family expenses, the Indian agricultural classes borrow only very small sums for agricultural expenses; but they raise large sums for all kinds of unproductive purposes. Thus, in the United Provinces, according to the Provincial Banking Committee, 70 per cent of the existing debt was contracted for unproductive purposes, and the same is more or less true of Bengal and Bombay.[1] In Madras, where things are slightly better, the proportion of unproductive borrowings was found to be 60 per cent in several districts. Even loans raised apparently for productive purposes, like purchase of land and education of children, often turn out to be speculative and improvident, in the peculiar circumstances of India.

By unproductive loans is here meant the borrowings, not merely for marriages and other social ceremonies, but also for family maintenance and payment of taxes. No doubt the expenditure on social ceremonies has been exaggerated, but it is still the principal cause of debt in many parts of the country. Indeed extravagance varies between caste and caste; yet both high and low are more or less subject to it. If the ignorant pariah does not mind selling his labour for life for having the pleasure of seeing his kith and kin get drunk on his wedding eve—a common occurrence among the labourers in several parts—many a brahmin will encumber his whole property and exhaust even his personal credit for celebrating marriages and paying dowries. Immemorial custom demands such extravagance, local custom compels it; and any violation of it would be stoutly resisted by one's relatives. The result is that one

[1] U. P. Banking Enquiry Report, p. 84; Bengal Report, p. 74; Bombay Report, p. 52.

has to borrow, whatever his repaying capacity and however exorbitant the terms. The limit of such loans is too often the maximum that the moneylender is prepared to advance, having regard to the property and income of the borrower. If a man whose annual income is only Rs. 100 borrows Rs. 500 for a wedding, is it any wonder if he gets inextricably indebted?

It is not fair to attribute all indebtedness to extravagant social expenditure. Large sections of agriculturists spend very sparingly for social ceremonies, but they too get into debt. The root cause of debt is the insufficiency of income, resulting from the smallness of holdings, inefficient methods of production and marketing and frequent failure of crops and loss of cattle.

The agricultural population of India has been on the increase, but the area available for cultivation is limited. The proportion of agriculturists to the total population has increased from 61 per cent in 1891 to 66 per cent in 1901 and 73 per cent in 1921; and the slight fall (2 per cent) recorded in the census of 1931, is of doubtful import. The total cultivated area is 228 millions, and only 20 per cent of it is irrigated. This works out at barely an acre per head of the total agricultural population, and about 4½ acres for every cultivating family.[1] Nor is the meagreness of area made up by the efficiency of production, as in the case of some of those thickly populated agricultural countries in Europe. India has the lowest outturn per acre in most lines of agricultural production. Is it any wonder if in such a country the agriculturist is poor and indebted? In 1928-29, before the trade depression started, the total outturn from the principal crops of British India was estimated at Rs. 1,018 crores, which works out at a *per capita* production of below Rs. 50, and according to the Banking Committee's estimates for the same year, the income per head of agriculturists came to only Rs. 42 (£3). Since then, the estimated value of the same crops has fallen to Rs. 536 crores (1931-32) owing to fall of prices and the *per capita* production must have also dwindled considerably.[2]

[1] If we take only owners and tenant cultivators (61 millions), each has 4½ acres to cultivate. See Census of India (1931), *Report*, pp. 288–89.

[2] See *Review of the Trade of India*, 1932–33, p. 10; *Indian Banking Committee Report*, p. 39.

Seeing that the food allowance for prisoners in Indian jails is Rs. 90 per annum, a *per capita* production of even Rs. 42 means that a large number of people are normally below the poverty line. As much as 81 per cent of the holdings in the Deccan village surveyed by Dr. Mann were found uneconomic, and this is confirmed by other similar investigations elsewhere. The result is that the great majority of Indian ryots are born in debt, live in debt, die in debt, and bequeath debt. And the last is not the least important; for, inexorable custom ordains that the son must pay the debts of the father, no matter whether the latter had left any assets or not.

In 1853, J. Bourdillon, a Madras Collector, wrote that the ryot 'was always in poverty and generally in debt'.[1] In spite of subsequent economic development and a decided increase of wealth in the country, the ryot's position has not improved to any substantial extent, for we find another Madras Collector writing in 1928 that 'for the average ryot, there is no surplus even in the prosperous year'.[2] This evidently betrays some maldistribution somewhere and calls for scrutiny. The net income of the great bulk of ryots is still so insufficient that they have to begin borrowing not long after harvest, generally by pledging their future crops. The creditor, who may be a petty dealer or moneylender, would unfailingly make his appearance at the threshing floor and exact his dues in kind, and generally grain rates of interest are much higher than money rates. The balance left for his consumption would be often so small that the ryot has to borrow again soon to maintain himself and to pay his kists. Thus the following year's crops are also hypothecated, and this goes on from year to year. When a bad year turns up—and such years are frequent in unirrigated areas—he cannot pay his dues and he has to mortgage his land, and mortgages generally end in sale. He may then become a tenant or labourer, and increase the rents which are already too high, or depress the wages which are already too low. On the other hand, when prices rise, the ryot will become hopeful, but he will either squander

[1] Srinivasaraghava Aiyangar's *Memorandum on the Forty Years Progress* (1892), Appendix.

[2] T. Austin, I. C. S., in his written evidence before the Madras Banking Enquiry Committee Proceedings, Vol. II, p. 60.

away the surplus by indulging in social expenditure, or he would borrow more money for purchasing new land at speculative prices and this may eventually encumber his other property also. Thus, debt is chronic among the great majority of Indian agriculturists.

Debt grows rapidly in India. If the genesis of debt is in improvident expenditure and unexpected happenings, its growth is largely due to the accumulation of interest. It is not proposed in this connection to go into the question of interest rates. Suffice it to say that interest rates vary with the nature of the security, the position of the parties and so forth. They are lowest in the ryotwari tracts, and highest in the zamindari tracts and where the ryot has not got full proprietary right in land, whilst in the Punjab and Central Areas, where there are impediments to the alienation of land, the rates vary between agriculturist and non-agriculturist lenders. Thus in Madras and parts of Bombay, 12 per cent is the common rate and the village moneylenders do not usually charge above 18 to 24 per cent even on unsecured loans, but in Behar and Orissa, Sind and Assam, the usual interest charged is between 25 and 50 per cent, and even in the United Provinces 18 to 37 per cent is the common rule. Indeed, landowners in most provinces can raise loans on first mortgage at rates between 9 and 12 per cent, but the small holders have often to pay higher rates; and as for tenants and labourers, who have no proper security to offer, the rates charged may be anything up to 150 and even 300 per cent. The rate of interest on grain loans is nowhere below 25 per cent, but in many parts of the country, it rises to 50 and 100 per cent. It is no wonder that agriculturists get into debt; for even if the interest charged is 6 per cent, it is doubtful if, except when prices are very high, the average ryot will be able to pay it without pinching from his wages. According to Sir Josiah Stamp, 'The world as a whole and over a given length of time has almost certainly been fed below cost price for the last 100 years, if one takes into account the proper elements of cost';[1] and this statement is more true of the *petite culture* of India than of the capitalistic agriculture of the 'new' countries.

[1] *World Agriculture* (Institute of International Affairs 1932), p. 260.

In fact, taking into account the uncertainties of weather the frequency of cattle mortality, and the fickleness of prices, agriculture, especially cereal-growing, is not a paying business, and if the Indian ryot sticks to it, it is not because it is profitable, but because it is a mode of life with him, the only mode of life available for him. The shrewd ones therefore prefer to let out land than cultivate it themselves, and the shrewdest turn moneylenders; for a man who lends Rs. 100 even at 6 per cent interest, has a more secure income than he who invests it on land. The net return from raising food crops is appallingly low, even in normal years, and with the low prices of today it is often a minus quantity. The lot of the ryot is really pitiable; nearly all the risks of agriculture fall on him. Government has a legal first charge on his produce and the moneylender has a virtual charge, but he, the risk-taker, the entrepreneur, gets hardly a fair wage for his labour, not to speak of profits. There are plenty of people to commiserate the lot of the industrial worker, who takes little risks, and who gets his share of the product the day he begins work, and Royal Commissions tour at great expense to enquire into his wages and improve his housing conditions, but there is scant pity for the toiling peasant who takes all the risks of agriculture and gets his share of the produce last (if there is anything left); who has too often starvation for his lot and lives in a miserable hovel, doing all the dirty job necessary to raise foodstuffs and raw materials essential for the world. He is the real Cinderella of world economy. This inequity in distribution has already brought its nemesis and it would be hard to revive world prosperity unless the 70 per cent of the world's population who toil in the fields are given a larger part of the world's total income.[1]

II

A Historical View

Indebtedness has always been with us; at no time known to history was the Indian agriculturist free from debt. But

[1] See Thomas, 'The Trend of International Trade', *Indian Journal of Economics*, October 1933.

in former times, the solidarity of the village community was a powerful bulwark against the accumulation of debt and alienation of property, and customs like *Dandupat* curbed the exorbitant demand of moneylenders. But with the establishment of a centralized administrative system, and its re-establishment on a more systematic basis by the British, the village community decayed and all the laws and customs that kept down debt fell into desuetude. The whole trend of developments in the 19th century favoured the growth of debt. In the first place, the land-settlements of the early 19th century established private property in land in a form practically unknown in the past, and this greatly enhanced the credit of the Indian zamindars and ryots by raising the value of land; and in this enhancement even the tenants shared after the passing of the various Tenancy Acts, which gave a fixity of tenure to the lease-holding classes. Land, which was formerly an encumbrance, became thus a valuable asset and a reliable agency for raising credit. Secondly, the establishment of a hierarchy of civil courts, with a new type of procedure enabled the creditors to effectively secure claims which they never could have ventured to claim under the indigenous system. The laws administered by these courts—the Indian Contract Act and the Civil Procedure Code in particular—gave a powerful handle to creditors, not only to recover their dues but to attach the cattle and implements of the debtor and even to arrest and imprison him.[1] This new system of judicial administration has had disastrous moral and economic consequences. Thirdly, the passing of the Registration of Documents Act (1864) and the Transfer of Property Act (1882) enabled claims to be systematically recorded and led to the growth of mortgages in number and value. Fourthly, the rise of prices, which was rapid after 1854 (although curbed in cotton tracts in the sixties) created too great an optimism and gave rise to increased borrowings; for, as Darling has shown, a rise of prices is generally followed by an increase of indebtedness.[2]

[1] Calvert, *The Wealth and Welfare of the Punjab*, p. 123; 'The sale of land in execution of decrees was almost unknown in the Punjab as recently as 1873–74.' Also Keatinge, *Rural Economy in Bombay Deccan*, p. 84.

[2] *The Punjab Peasant in Prosperity and Debt*, pp. 15 and 40.

All the agencies mentioned above were intended to regulate economic dealings, and they were all essential for modernizing India's economic life, but the circumstances of India have been such that while those agencies legalised the rights and furthered the interests of the enlightened classes, they had just the contrary effect on the great majority who are improvident and illiterate. The secure right to property is a blessing, but in the hands of the average Indian ryot it is often a curse. Gide's remark about credit is apposite in this connection. 'It has often been said', writes he, 'that credit holds up the landowner as the rope holds up the hanged man'.[1] As a shrewd Englishman wrote in the last century, 'To a people in the state of civilization to which India has reached, a secure title to a fixed income only means the power of borrowing on the occasion of a marriage, a funeral or some great family festival more than the borrower can ever pay'.[2] Hence the dangers of facile credit to a people ignorant of the true use of credit.[3]

No wonder that during the last forty years, which witnessed a steady rise in commodity prices and land values, indebtedness has been also steadily on the increase. We have no accurate statistics, but enough can be inferred from a comparison of land values and commodity prices in any province with the average mortgage rate per acre and the total mortgage debt there. In the Punjab, the mortgage rate was only Rs. 19 in the quinquennium 1900-05, but it rose to Rs. 85 by 1924. Thus, while the general price level of exported articles rose by about 105 per cent between 1900 and 1924, the mortgage rate rose by 347 per cent. The annual mortgage debt also increased more than the price-level during the same period. In the Madras Presidency, the total annual value of mortgages which was only Rs. 6.67 crores in 1891-92 rose to Rs. 7.75 crores by 1900 and to Rs. 14.78 crores in 1914, and between 1919 and 1928 the average had been as high as Rs. 20 crores. Similar increases must have taken place in other provinces

[1] *Political Economy*, p. 394.
[2] Fergusson, *Indian Architecture* (quoted in Nicholson's Coimbatore District Manual).
[3] Report of the Royal Commission on Agriculture, p 425.

also. The following table will bring out the position of Madras in this respect :—

Year	Mortgages		Index Number of Prices	
	Number	Aggregate value Rs.	Indian Index numbers Exported articles (1873 = 100)	Index numbers of paddy prices in Madras 1874-75 to 1883-84 = 100[1]
1899-1900*	3,64,811	7,75,75,561	100	117·7
1900-1	4,10,746	8,25,14,728	124	96·3
1901-2	4,11,989	8,29,23,837	116	111·2
1902	3,84,057	8,11,40,299	113	94·4
1903	3,80,400	7,69,96,330	103	96·3
1904	3,66,666	8,19,78,988	104	109·4
1905	4,50,402	8,80,87,142	116	139·2
1906	4,83,218	9,88,52,441	139	145·7
1907	5,04,030	10,52,87,218	145	152·5
1908	5,19,548	11,47,90,784	151	165·3
1909	5,31,976	12,05,58,403	133	148·2
1910	5,20,831	12,33,63,327	127	135·8
1911	5,28,987	13,02,00,237	136	158·4
1912	5,69,609	14,61,92,551	145	180·5
1913	5,63,604	15,14,87,657	154	175·8
1914	5,32,331	14,78,98,968	160	162·5
1915	5,18,178	15,03,71,306	155	161·9
1916	5,39,585	15,79,31,266	163	168·1
1917	5,29,597	15,58,19,013	170	169·0
1918	5,40,163	17,07,40,138	199	246·7
1919	6,93,606	20,27,63,990	277	300·4
1920	5,93,933	20,62,08,902	281	239·2
1921	5,93,761	20,84,81,946	239	239·2
1922	5,00,301	19,66,60,355	245	237·0
1923	4,90,096	19,07,61,541	224	221·8
1924	5,06,918	19,94,18,477	222	270·0

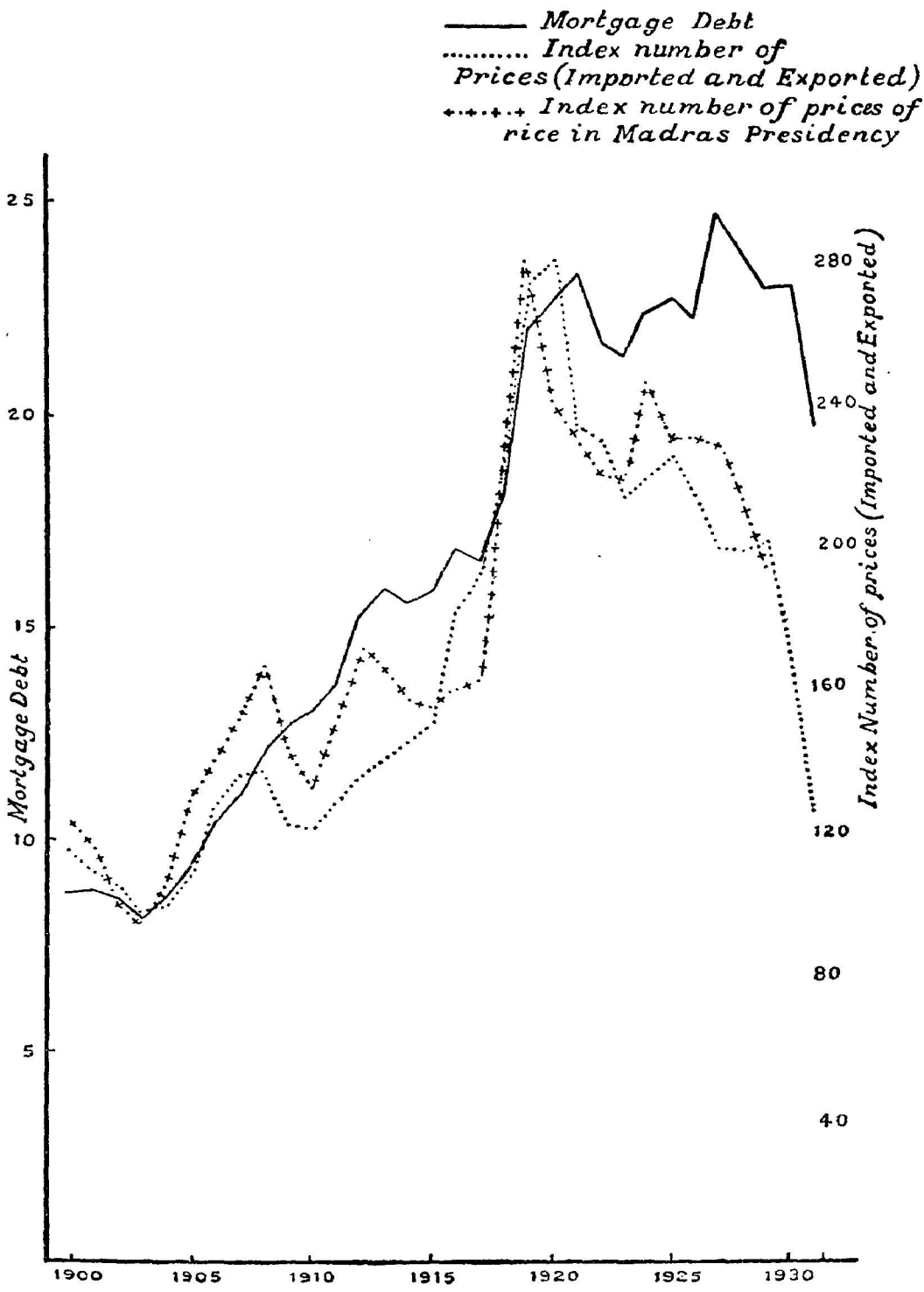
[1] See note on p. 38.

Year	Mortgages		Index Number of Prices	
	Number	Aggregate value Rs.	Indian Index numbers Exported articles (1873 = 100)	Index numbers of paddy prices in Madras 1874-75 to 1883-84 = 100[1]
1925	5,08,355	20,10,06,341	233	246·7
1926	4,94,227	19,71,02,316	225	236·7
1927	5,25,747	20,56,72,473	209	239·2
1928	5,10,974	19,87,43,259	212	227·1
1929	4,85,850	19,65,66,096	216	189·5
1930	4,44,182	18,93,94,547	177	...
1931	3,89,487	17,69,89,913	125	...
1932	4,18,235	17,68,50,031	...	...

Since 1929, when prices fell rapidly, mortgages have also recorded a fall, but not to the same extent as prices. Thus while the index number of prices of exported articles fell by 47 per cent between 1929 and 1932, the total value of mortgages fell only 10 per cent, and the number of mortgages has only slightly fallen. This is not due so much to the contraction of new mortgages as to the renewal of the old ones, rendered necessary by the fall in land values. In some parts of the Presidency most of the mortgages of the last two years are of this category. In fact credit has been greatly restricted of late, and new loans are few. This is indicated by the fall in the total value of bonds in the Presidency from nearly Rs. 4 crores in 1930 to Rs. 1 crore in 1932.

The total indebtedness of the various Provinces and States of India in 1928-29 was estimated by the Banking Enquiry Committees in 1929. Those figures are given below with the estimated values of total production of the various Provinces in 1928-29 and 1932-33, in order that some idea may be

[1] In the case of the first three years, the mortgage figures are for the financial year, and in the case of index numbers of paddy prices, the financial year is invariably used. For the rest, the figures are for the calendar year. The paddy prices are from N. K. Adyantaya's paper on 'A Satistical Study of the Prices of Food Grains in the Madras Presidency' in the *Madras University Journal*, July and December 1933. The figures for mortgages are from the Inspector-General of Registration, Madras.


Mortgage Debt
Index number of Prices (Imported and Exported)
Index number of prices of rice in Madras Presidency
Mortgage Debt
Index Number of prices (Imported and Exported)
25
20
15
10
5
280
240
200
160
120
80
40
1900
1905
1910
1915
1920
1925
1930

formed of the *nominal* and *real* burden of the indebtedness in India today.[1]

Province	Population (Millions)	Total indebtedness (Crores)	Average indebtedness per agriculturist Rs.	Total production of the principal crops Value in *Lakhs*	
				1928–29	1931–32
Madras ...	46·7	150	50	1,80,78	1,01,25
Bombay ...	21·8	81	49	1,20,52	66,56
Bengal ...	50·1	100	31	2,32,59	1,06,71
United Provinces ...	48·4	124	36	1,40,52	92,21
Burma ...	14·6	50 to 60	...	63,38	29,20
Central Provinces ...	15·5	36	30	68,77	32,42
Punjab ...	23·5	135	92	76,78	37,49
Bihar and Orissa ...	37·6	155	31	1,35,17	71,05
Assam ...	8·6	22	31	...	...
Central Areas ...	...	18	...	...	...
Total British India ...	271·5	881	...	10,18,51	5,36,89
Hyderabad ...	14·4	...	...	...	...
Mysore ...	6·5	...	...	...	...
Travancore ...	5·0	27	54	...	...

III

The Evils of Debt

The menace of indebtedness arises from the fact that it has dire *economic*, *social* and *moral* consequences.

Debt leads directly to agricultural inefficiency. A person overburdened with debt can have little incentive for making the utmost use of his lands, nor will he be interested in introducing better crops and better methods. Hence the very poor response to the work of the Agricultural Depart-

[1] The figures of total indebtedness given by the Banking Enquiry Committees are not based on any accurate statistics, and need not be taken at their face value. See the author's remarks in a separate note attached to the Madras Banking Committee's *Report*, pp. 270–72.

ment. Debt also prevents orderly and profitable marketing. Many of the ryots who borrow from town merchants or brokers give a lien to them on their crops. In some cases, the borrower is bound to sell at prices previously fixed, or on other terms materially profitable to the stronger party. Even if the lender forces the borrower to sell his produce on the threshing floor, the same consequences will follow. Such tying of moneylending and trading are generally detrimental to the interests of ryots, and must be avoided if they are to obtain the maximum prices for their produce. Only by the firm establishment of co-operative marketing can such a change be brought about.[1]

Debts generally result in loss of property. Unless exceptional circumstances intervene—be it a windfall or a sudden rise of prices—mortgages generally end in sale. In this way land is frequently changing hands. According to some observers, all land in a village changes hands once in thirty years; at any rate in certain tracts, most land has changed hands during the last 30 or 40 years. That this is a social evil will be easily conceded, but its economic consequences are not so certain. The transfer of land from the debtor may result in greater productive efficiency if the new owner is himself a keen cultivator. But as generally happens, the land passes to professional moneylenders or non-cultivating landowners, and those classes usually let their land to tenants. Thus tenancy increases, and tenant-farming generally is not noted for efficiency. The Indian Banking Committee points out that where moneylenders are mostly landholders (chiefly in the Punjab and Madras), changes in the ownership of land are not detrimental to agricultural efficiency, but this is a highly questionable view, seeing that such transfers lead to the increase of tenants and tenant-farming, which is not desirable in many ways. The peasant proprietor is the pride of any country, and the decay of that class necessarily leads to a weakening of the moral fibre of society. As Arthur Young puts it, 'the magic of private property turns sand into gold.' He who doubts it may compare tillage in ryotwari and

[1] See *Report of Investigations into the Finance and Marketing of Cotton* (Indian Central Cotton Committee). Madras Banking Report, pp. 187–97 ; Bombay Report, pp. 147–152 ; also K. C. Ramakrishnan, 'Financing and Forced Sale of Produce ', in *Indian Journal of Economics*, 1930.

zamindari tracts.[1] A comparison of the conditions in East and West Germany, or in Denmark and Ireland (till lately) will also bring this out.

There is every indication that landless agriculturists have increased in India in recent times. In 1921, for every 1,000 ordinary cultivators, there were only 291 farm servants and field labourers, but in 1931 the proportion of labourers was found to have increased to 407 for every 1,000 cultivators.[2] This sudden rise may be partly due to a change in classification but there is no doubt that the number of landless men is on the increase, specially in wet areas, and no agricultural improvement is possible unless the pressure on land is diminished. The growth of a landless proletariat is also a social menace and every effort must be made to reduce it; this is not possible if indebtedness continues at the present levels.

The worst social and moral result of indebtedness is that it entails servitude. In ancient Greece and Rome the debtor was the slave of the creditor. Some vestiges of that custom are still found in the arrest and imprisonment of judgment debtors, which obtained formerly in most European countries. In the last century, it was abolished in most of those countries, but was newly introduced into India. The Civil Procedure Code, wherein this provision was made, exempts from attachment the bare means of subsistence of the debtor but not his person. The anomaly in this law was pointed out by no less an authority than Sir Courtenay Ilbert in 1888, but even now the law is in the statute book.[3] It is not only a source of harassment but entails great economic waste.

The Kamiauti agreements of Behar and Orissa and the Pannaiyal system of Madras remind us of such servitude. In both cases, a labourer borrows a small sum of money to celebrate a wedding or funeral, but in return he has to work for the lender, receiving a bare pittance for his

[1] See Thomas, 'The Economic Incidence of Tenurial Systems', (*Indian Journal of Economics*, 1929); also 'Peasant Proprietorship' (*Indian Journal of Economics*, 1926). Also *Agricultural Tribunal of Investigation, Final Report*, pp. 306–310.

[2] Census of India (1931), Vol. I, p. 288.

[3] In his Statement of Objects and Reasons to the Debtors' Bill of 1888, Ilbert wrote: 'Of what use is it to reserve by law to the debtor the bare necessaries of life when he can be compelled to give them up by the threat of imprisonment?'.

livelihood. He can never be expected to save up the amount needed, and therefore the transaction becomes an indenture for life. In Behar such agreements are now null and void under an Act of 1920, unless those are terminable within a year and provide for equitable remuneration for labour. But the Kamia is too powerless to set the law in motion, and the law is said to have failed.[1] In Madras, there is no formal agreement; the promissory note for the loan taken is the weapon in the lender's hands. On the borrower refusing to work, a suit will be filed and eventually he will be arrested and imprisoned. That fear hangs like Damocles' sword over his uneasy head and makes him work for the lender without grumbling. In the Central Provinces too, a similar system prevails, under which the debtor or a member of his family has to render service to the creditor, with or without payment, for a fixed period. Wherever the moneylender is an influential local notable, especially if he is also the landlord, the ryot has to do free service when called upon, and when he fails to do so, civil or criminal suit may follow.

The condition of those weavers and other artisans who obtain advances from moneylenders is also similar. In all these cases, the poor borrower is subject to exploitation, and firm action is necessary to put it down.

A society steeped in debt is necessarily a social volcano. Discontent between classes is bound to arise, and smouldering discontent is always dangerous. It may not everywhere blaze out in a revolution; but recurring social unrest is worse than revolution, in that it perpetuates economic inefficiency and puts off reconstruction.

IV

Remedial Measures in the past

Various attempts have been made for remedying indebtedness. Since the days of the Deccan riots, Government has undertaken a series of measures for meeting the credit needs of the ryot and for preventing indebtedness. Takavi advances had always been granted to ryots, and this provision was amplified by the Land Improvement Loans Act (1883) and Agriculturists Relief Act (1884). Such direct aid, meant

[1] Agricultural Commission Report, pp. 434-45.

rather for years of crop failure, was naturally inadequate to meet the ryots' needs in ordinary times and subsequently the system of co-operation was introduced into the country by an Act of 1904; and to prevent agriculturists from losing land, limits were placed on the freedom to alienate land in the Punjab and elsewhere. All these measures have done some good, but it would be a gross exaggeration to say that they have solved the problem of rural indebtedness. The co-operative principle introduced in 1904, and subsequently amplified by several Acts, is a very valuable one indeed, and has worked wonders elsewhere, but merely by providing a means for doling out credits to needy ryots, such results cannot be achieved. The crux of the problem of agricultural credit is that the loan granted must increase the efficiency of production and its repayment must emerge from an enhanced income. This requires that the co-operative society must not only grant credit, but control its utilization by prescribing and organizing profitable forms of production and marketing, so that the borrower's income may thereby increase. It must also curb the improvident social expenditure which leads the ryot to the gates of moneylenders. And so long as such functions are not undertaken in an organized manner, the co-operative society will remain a mere lending agency, and over-dues are bound to mount up. Further, by not limiting itself to short-term loans, the co-operative system has sown the seeds of decay, which it is now reaping.

There is still a common impression that the problem of rural finance is supplying credit on easy terms. That facile credit is not generally a blessing to improvident agriculturists has been repeatedly demonstrated in India as well as elsewhere. As the Royal Commission on Agriculture puts it: 'In fact cheap credit is a blessing to a rural population only where the average cultivator is possessed of the knowledge and strength of character required to induce him, on the one hand, to limit his borrowings within the range of his capacity to pay, and on the other, to apply the greater part of the borrowed money to sound productive purposes. To lavish easy credit on those unaccustomed to its proper use is to condemn the borrowers to certain financial destruction. The provision of facilities for cheap credit must at the outset bring

new temptations as well as extended opportunities. Those only can hope to profit by its opportunities who have learned to resist its temptations.'[1] Unfortunately a large number of our ryots have not learned to resist such temptations, and hence the alarming growth of indebtedness in the country.

Another popular impression is that indebtedness may be cured by controlling and curbing moneylenders. This may look more reasonable, but it is equally erroneous. Indeed moneylending must be regulated like everything else that affect the public—and who is not a Hegelian in these days?—but if it is hoped that by such a measure, indebtedness can be cured, it is a hopeless delusion. You may regulate moneylending, bring it under stringent control, but that may not relieve the burden on their clients; rather their burden may increase thereby. So long as there are impecunious and improvident people, speculative moneylending will go on; and even in prosperous countries like England, there are usurious lenders who realise 300 per cent on their petty loans to penurious people.[2]

Attempts have also been made to control usury by keeping down rates of interest. Ancient Indian custom prescribes 12 per cent as the normal rate, and interest was not to accumulate beyond the principal (*Damdupat*). This rule is now in force in parts of Bombay Presidency and in the city of Calcutta but not in Madras. In Travancore a benevolent Maharani, ninety years ago, ordained that accumulated interest should not exceed half the principal in the case of money loans. In the East India Company's days regulations existed in all the three Presidencies prescribing rates of interest, and records of certain enquiries made in Madras about interest rates as early as 1825 are extant in the Madras Record Office.[3] The Usurious Loans Act of 1918 gives wide powers to the courts to disallow exorbitant rates of interest and reopen all loan transactions, if necessary. But the Act has not been widely used, and the general impression is that it has not succeeded. The fact is that an effective regulation of interest is practically impossible in a country where improvident

[1] Report, p. 425.
[2] *New Statesman and Nation*, August 12, 1933; also August 19, 1933, p. 206.
[3] Regulation XXXIV of 1802; and Regulation II of 1825; replies from District Collectors to a Circular letter of 1825.

borrowing and speculative lending are so widely prevalent as in India, and however stringent the law, it will be evaded in many ways. The needy client can easily be forced to sign a document for a larger sum than actually received by him. Even the Travancore law is evaded by the debtor renewing the document after five years, and he can be forced to do so under threat of court decree and arrest.

Lately, there has been a growing public opinion in favour of a simpler system of insolvency, and this view has received the support of such high authorities as the Royal Commission on Agriculture, the Civil Justice Committee, and the Indian Banking Enquiry Committee. It is true that the Insolvency Act is not now very much utilized by the agriculturist debtors owing to the complexities of the law, but then we have to remember that a simpler form of insolvency may further increase the temptation to improvident borrowing. Already the behaviour of a growing class of rural debtors is not such as to evoke sympathy for them. Some of them borrow with no intention to repay and often use every means to hoodwink their creditors. With easier avenues to insolvency, such behaviour will grow worse and this may drastically weaken the credit of agriculturists. It is always assumed that the creditor is a Shylock and the debtor an innocent victim, but that is not so in a growing number of cases. Therefore, while abating the rigour of law against the honest debtor, means must be found to detect and severely punish the knavery of dishonest debtors.

It is thought by certain politicians that indebtedness can be cured by the simple remedy of repudiation. They little understand the social and economic implications of such a revolutionary measure. A periodical cancellation of all debt, like the Jubilee year of the Jews (every 50 years), has some theoretical advantages to commend it, but its adoption is not practicable at the present time.

The fundamental weakness of all such measures is that they curtail credit. To curb usury by restricting credit cannot be a boon in a country like India, where the credit needs of agriculturists are still chiefly met by moneylenders. No other agency in the country has the resources to replace the moneylender. Whatever measures we undertake must bring

usury under control without restricting credit. If by avoiding the scylla of usury, the ryot bangs on the charybdis of curtailed credit, nothing good can come out of it. All legislation to regulate moneylending and rates of interest must take this into account. In fact such legislation has generally failed, and is bound to fail.

There are only two effective remedies for a radical cure of indebtedness. The first, which is the more important, is the increase of agricultural income by resort to more efficient methods of production and marketing; the second is the reduction of improvident expenditure and increase of thrift. These are the essential conditions of any substantial advance. It is not easy to increase the ryot's income, but under a planned agricultural development, it would be possible to raise productive efficiency and eliminate wastes all round, and thus increase the net income. The reduction of unproductive expenditure is possible by a nation-wide campaign against extravagance in social ceremonies, litigation and intemperance. But only a strong government receiving active support from the people can carry out such plans effectively. The alternative is a dictator like Mussolini, but the methods of dictators are necessarily drastic. Mussolini stamped out usury, not by passing a Usury Act, but by banishing the usurious lenders to a far-off island. Without attempting anything so drastic, we may gradually eradicate extravagance, provided the village panchayats agree about it among themselves and provided our schools inculcate thrift in all possible ways. The co-operation of social and religious organisations is important in this matter. Christian missionary efforts have been remarkably successful in this work in certain parts of India, e.g., Chota Nagpur.[1]

V

The Immediate Problem

But such general remedies will take time; and as for planning in a diversified country like India, it is a complex matter. We are yet only grappling with the preliminaries to planning,

[1] For the work of the Catholic Mission at Ranchi, see the Behar and Orissa Banking Committee Report I, pp. 33; Vol. II, pp. 662–74. See also, Hatch, *Up From Poverty* (1932), dealing with Y.M.C.A. work in S. Travancore.

and are not even on its threshold. But indebtedness is pressing and calls for urgent relief. The burden of debt has increased by the heavy slump in prices, and if not helped in time, a good many of the ryots will lose their property and sink into the position of labourers and tenants, and thus depress wages and increase rural congestion.

Depression is necessarily a period of hardship for the debtor classes in the community; it leads to an unjust redistribution of wealth. While the creditor gets a premium, the debtor gets a penalty in that he has to return a much larger purchasing power than he received. Two principal depressions occurred in India during the 19th century, the first in 1820-54 and the second in the sixties. But neither of these apparently affected the country as much as the present depression; nor were they so widespread. During the first period, India was not so dependent on foreign trade as now, and the second depression affected chiefly the cotton tracts. Further, the general price-level never seems to have fallen so rapidly and drastically as between 1929 and 1932. The result is that all debts have increased in quantity as well as in burden. Since 1930, borrowings have been fewer, but the bulk of the older debt remains unpaid. According to an estimate made by the United Provinces Agricultural Debt Enquiry Committee, only 7 per cent of the long-term debt and 25 per cent of the short-term debt had been repaid annually since 1930.[1] The proportions may be more or less true of other provinces. Interest payment has slackened everywhere, and according to all accounts, hardly 20 per cent of the interest due annually must have been paid in the last three years. Calculating on this basis, the total agricultural debt of British India must have increased from Rs. 900 crores to about Rs. 1,200 crores; and that of Madras from Rs. 150 crores to Rs. 200 crores. But this is no indication of the real burden which is much higher. With nearly a 50 per cent fall in the prices of our staple products, the real burden of debt has more than doubled since 1929. The nominal burden of a debt of Rs. 100 raised in 1929 is still Rs. 100 and, if no interest has been paid, Rs. 148, but the real burden is about Rs. 150 and with interest about Rs. 222. If the total debt

[1] *The U. P. Govt. Gazette*, September 10, 1932, p. 257.

of British India in 1929 was Rs. 900 crores, and if no repayment of principal was made in the meantime, the real burden of that debt must now amount to about Rs. 1,800 crores, and if all interest is in arrears, Rs. 2,200 crores. As shown above, the total production in the chief crops has in the meantime diminished from Rs. 1,018 crores (in 1928-29) to Rs. 536 crores (in 1931-32). Thus while the income has greatly diminished the debt has vastly increased.

Such is the problem facing us. But such a problem has been facing most countries, and some of them are even worse off. Two lines of action have been pursued by them. On the one hand, they have resorted to various measures of relief and on the other, attempts have been made to raise prices. The plan of action for raising prices consisted in carrying out public works and devaluating currencies. The public works programme injected purchasing power into the community and revived demand to a great extent. By abandoning the gold standard, several countries have given a prop to export trade and thus kept up prices in the country. Australia, Japan, and Britain have resorted to all these measures, whilst on the continent of Europe, the principal line of action has been carrying out public works and regulating import trade by means of exchange restrictions and import quotas. Had these measures been undertaken on an international scale, great success would have resulted from it, but even by national action countries like Japan and Australia have given considerable relief to agriculturists.

Direct relief has taken different forms. In some countries, Government has given financial assistance to farmers in order to lighten the burden of debt ; in others, firm measures have been taken for preventing the loss of indebted farms and for checking the inordinate accumulation of interest.[1] Thus, the Farm Relief Act of the U. S. A. provides for the issue of 4½ per cent federal land bonds to the amount of $2,000 million with the object of making mortgage loans to farmers at 5 per cent in order to enable them to repay existing mortgages carrying higher rates of interest. By this and other measures, a powerful effort has been made by the U. S. Government to

[1] See *World Economic Survey*, 1932-33, pp. 150-60, 311-15.

regulate agricultural production and to raise prices with a view to improving the farmers' income, but the recent unrest among farmers indicates that the measures have not been attended with much success. In Italy, agriculturists' debts have been converted into 25 years' mortgages with annual payment for interest and redemption which may not exceed $7\frac{1}{2}$ per cent per annum. In Germany, a law of May 1933 enables debtors to appeal for special assistance in respect of debts entered into before 1931. In Austria, encumbered agricultural property is protected from forced sale, under certain conditions. In several States of Australia, the right of selling mortgaged property has been restricted by legislation and measures have been taken to keep down interest. In these and many other countries, measures have been taken to postpone debt claims, give priority to new loans, convert short-term into long-term obligations, negotiate rent reductions and convert fixed money rents into yearly payments depending upon the value of farm produce. In Holland, courts have been set up to negotiate between agricultural debtors and creditors and compulsory interest reductions have taken place in many countries. In Denmark, country boards have been set up with power to postpone interest and amortisation payments, making provision for new loans and moratoria of old loans, granting tax relief, limiting interest rates and so forth.[1]

VI

Debt Conciliation in India

In India nothing spectacular has been done by way of agricultural relief. In most provinces, some part of the land revenue has been remitted or held in abeyance. In the United Provinces, a comprehensive scheme of agricultural relief is contemplated and Bengal may follow suit. The unlinking of sterling from gold in September 1931 resulted in a certain degree of devaluation of the rupee, but this has not produced any great revival of prices. There is a growing desire that a large measure of devaluation must be carried out as in

[1] See *World Economic Survey*, 1932-33, p. 159.

Australia, so that our export trade may obtain an advantage even over the sterling area, but recent currency experiments elsewhere make one doubt if a slight devaluation—e.g., lowering the ratio to 16d.—would provide any real stimulus to our export trade or serve to raise our internal prices to any perceptible extent. Our export trade has dwindled because of a fall in demand abroad for our goods, and if a real revival is to take place, it cannot be by mere currency manipulations. Further, as only a small proportion of our total production is exported—unlike Australia—it is very doubtful if a slight devaluation would have any tangible effect on our general price-level. A more effective means of reflating economic activity and thereby reviving prices would be to carry out a large programme of productive public works spread all over the country, so that purchasing power and consumers' demand may revive. This is likely to benefit industry as well as agriculture.

But there are no sovereign remedies for raising prices immediately, and it is useless to expect any immediate relief to indebtedness by such measures of general relief. If our aim is to give some immediate relief to the burden of indebtedness, we must do something more direct. Such direct relief has been provided in Germany, Holland, Denmark and in several American countries. The principal agency used in the settlement of debt is conciliation between debtors and creditors with the object of securing a composition of the standing debt. Nor is this anything new in India. It has been practised in various parts of this country during the last 30 years. In the Central Provinces, debt conciliation was carried out in several districts during the depression resulting from the famine years of 1897-1900. In Orissa a remarkable effort at debt redemption was made by Government between 1906 and 1912; subsequently, in the Punjab, similar attempts have been made in several districts. Since the depression began, the Government of the Central Provinces and the Durbar of Bhavnagar State have carried out legislation for debt conciliation and have launched on comprehensive programmes of debt composition.

The essential feature of the scheme is the appointment by Government of a Conciliation Board, or Commissioner, for

adjudicating between the parties. The Board is authorised to go through the whole transaction, and having regard to the nature of the loan, the position of the two parties, and the trend of the price-level since the debt was contracted, they would settle upon the amount to be repaid, and the mode of repaying it. Conciliation may be compulsory or voluntary. In exceptional circumstances, compulsory conciliation might be justifiable, but in provinces where the principal source of agricultural credit is the agriculturist himself, such a drastic remedy may not be essential. In Bhavnagar, a majority of the ryots and sowkars of the Mahal must apply jointly if a conciliation board is to be set up, and since most of the Mahals have asked for it, it is clear that the scheme is popular with the sowkars as well. In the Central Provinces, the recent Act authorises the Government to set up conciliation boards in every district; but the concurrence of the creditors to whom 40 per cent of the debts are due is necessary if the case of a debtor is to be considered by the Board. Nor is the award unconditionally binding on the parties. When settlement is obstructed by the obduracy of the debtor or the creditor, the Board may issue a certificate stating who in their opinion is the unreasonable party. The creditor may then resort to the ordinary courts, but he will not get the costs of his suit, if he is the unreasonable party, and the rate of interest from the date of the certificate will only be 6 per cent per annum.

The method of repayment is the crux of the whole problem. If ready cash can be paid, the creditor would agree to large reductions, but if the amount is to be paid in small instalments lasting over a long period, confidence is lacking and agreement becomes difficult. The chances of ready cash being paid are necessarily limited, and usually the sum is to be paid in instalments, but unless Government or a land mortgage bank undertakes to pay the instalments, settlement is generally difficult.

The redemption of the debt directly by Government is the simplest solution. This was the system tried in Ranchi District during 1906-12. Government advanced about Rs. 1¼ lakhs for redeeming debt, but did not proceed with it any further; for, Government soon realised that there were serious

difficulties in recovering the amounts advanced on behalf of debtors.[1]

Today, a similar scheme of debt redemption by Government is being put through in Bhavnagar. In that State, the Liquidation Committee is authorised to write off any debt which is more than three times the land revenue assessment. The compounded amount would then be advanced by Government on behalf of the ryot, and Government would recover the amount from the State's share of the produce of each ryot, the lands being held on the *bhagbatai* system. The land revenue and the takavi advances are first deducted from the State's share, and the balance would go to repay the State's advances to the sowkar. When there is a bumper crop, the ryot may repay the whole or any part of the loan in a lump sum. Such a scheme of debt redemption has already been carried out in two-thirds of the State which involved the settlement of a debt of about Rs. 60 lakhs. The usefulness of the scheme is evident from the fact that in most cases, the debt amounts have been drastically cut down by the Liquidation Committee. For instance, the total nominal debt of the first five tappas taken up was Rs. 14,19,378, but it was compounded by paying the sum of Rs. 3,67,991, thus reducing the burden of debt by full three-fourths. The annual interest charges alone had amounted to that sum and therefore by paying a year's interest charge the khedut would be totally freed from debt. At the same time, the sowkars are also benefited, in that they are able to recover in cash, and at one stroke, far more than they could if left to their own devices. The success of the experiment is clear from the fact that land revenue and customs receipts have increased in the current year. It must be remarked that all this was possible by the bold generosity of the Maharaja and the wise statesmanship of Sir Prabhasankar Pattani.

Whether the Durbar will be able to recover from the ryots the amounts advanced on their behalf remains to be seen, but the peculiar conditions of the State, especially the Bhagbatai system of sharing produce between Government and the ryot, may facilitate repayment. But what is possible in

[1] *Indian Banking Committee Report*, p. 64 ; *Behar and Orissa Committee Report*, pp. 57–58.

a small State like Bhavnagar, with only half a million people, may not be practicable throughout the country.

Recently a scheme of debt redemption by the State has been proposed for British India by Mr. Jamnadas Mehta, Mr. Nalini Ranjan Sarkar and others. According to Mr. Mehta, the State must take over the ryots' debt and convert sowkar's loans into its own at a moderate rate of interest and sinking fund. 'Any sowkar who can establish a debt due from an agriculturist before a properly constituted authority within a specified period should get bonds for an amount equivalent to his loan. The bonds should have a currency of sixty years and should be issued at 4 per cent interest (plus 1 per cent for amortisation and debt service), and the State should recover this from the peasant as land revenue, so that no separate expense need be incurred for collecting it. While this loan remained unpaid, the peasant should not be permitted to alienate his land in favour of a sowkar.'[1] Mr. Nalini Ranjan Sarkar has also made a similar suggestion, but a more restricted one. He would like the State to take over the debt of at least those ryots, who although incapable of repaying their debt, have holdings ample to maintain them if freed from encumbrance; for, he thinks that unless they are so helped, they will lose their holdings and swell the ranks of landless labourers, who are already so numerous. For obtaining the funds, 'Government may float a loan for the total amount, payable in 50 or 60 years, out of which they could settle the claims of the mahajans and later gradually repay the same out of public revenues.[2]

The carrying out of such a comprehensive debt redemption throughout the country is beset with many serious difficulties and is likely to result in some social injustice. Even if money-lenders agree to the compounding of debt on receipt of sixty-year bonds—which is unlikely—it would involve a great burden on the tax-payer, both present and future. Indeed instalments can be recovered from ryots along with land revenue, but with assessments already believed to be pressing heavily on land and with a growing tendency to sub-division of holdings, a regular recovery from the ryots is extremely

[1] From report of a speech in Bombay, 29th October 1933.
[2] 'The Problem of Agricultural Indebtedness' (1933), p. 26.

unlikely. The result would be a premium on improvidence and a penalty on thrift. The hardworking ryot will have to pay for the folly of his improvident neighbour. As a well-known authority on Agricultural Credit puts it: 'It is contrary to elementary justice to burden the whole of the population with the debts of interested owners. Besides in many instances, an insolvent exploitation would take place; in others, again, the State would be under obligation to effect the redemption and the whole of the country would be burdened with debts contracted with the most inexcusable light-heartedness.'[1] In such a state of things, agricultural credit would contract itself to the great detriment of the whole community.

VII

The Rôle of Land Mortgage Banks

The proper agency for the settlement of the compounded debt is the co-operative land mortgage bank. Its large resources, its system of equated payments and the guidance and protection it receives from the State will enable it to undertake such a function satisfactorily. The failure of early experiments at debt conciliation in India was due to the lack of such an agency. With such banks willing to undertake repayment, creditors would readily agree to make substantial reductions in their claims.[2] Indeed the land mortgage banks may not be able to undertake such a duty in the case of all landholders. They can only take up the debt of those who own land, which in extent and quality is ample to produce an annual net income adequate to meet their instalments, but this is not the case with a large number of agriculturists. Indeed if the creditors' demands are substantially cut down, more of the ryots can be brought within the category of those qualified to receive help from the land mortgage banks, but even after pushing up such persons, there would still remain many whose only salvation lies in insolvency. Further, in order to be so useful, the land mortgage banks must agree on equated payments spread over a long period of time, so that the annual instalments may not be found too heavy in periods of low prices. A system of

[1] Boyazoglu, *Agricultural Credit*, (1932), pp. 164-65.
[2] Banking Committee Report, p. 64.

graduated payments may also be advisable in view of changes in seasons and in price-level. In Europe, loans for 50 years may not be uncommon, but in the conditions of India there are various difficulties in spreading out repayment for so long a period. However a period of 20 to 30 years cannot be too long even for India, provided the security is good.[1]

Further, the co-operative primary land mortgage banks cannot serve the needs of the larger landowners and zamindars. At present land mortgage banks do not lend more than Rs. 5,000 to a single person, whatever his security. The necessity has therefore arisen for the establishment of land mortgage corporations on the joint stock basis, which could command extensive funds and are able to help the larger landowners. Dawson's Bank of Burma is to-day the only joint stock bank of that kind in this country, and this is precisely the time when more of such banks should arise. We may learn much from the experiences of the *Credit Foncier* of France, the Hypothek Bank of Japan, and most of all from the English Mortgage Credit Corporation, which was established in 1928. The leading joint stock banks of England are shareholders of the Corporation, and Government, is authorised to advance an amount not exceeding £750,000 for establishing a guarantee fund, and this is to be free of interest for 60 years. As the period of repayment of loans is spread over a maximum of 60 years, this institution can render substantial aid to indebted landowners.

However thorough the work of conciliation boards and however generous the agency entrusted with debt redemption, a large number of landholders will have to give up their lands and look to some other means for maintaining themselves. Indeed there is a strong public opinion for exempting from sale the property indispensably necessary for the maintenance of the insolvent's family. The Civil Procedure makes some provision for it, and both the Royal Commission on Agriculture and the Central Banking Committee strongly recommend an enhancement of this provision. The Royal Commission, while recommending a simple Rural Insolvency Act

[1] The Central Banking Committee recommends that 'for the present the maximum period should be 20 years. We hope that with sound management the banks should be able to extend the period to 30 years, if necessary.' (p. 169).

suggests that 'just as creditors have a right to insist that all debtors' assets should be impounded and applied towards the payment of the debts, so also the debtor should have the clear right to be allowed to earn his living if he can and to be free to make a new start in life.' Indeed if the property so left is sufficient to maintain the family, it may be economically advantageous, but if it is not, as is likely, such leniency would do no real good to the debtor or the community. The best solution for the problem would be to enable such persons to migrate to new land or to industrial centres, and thus not only will they be enabled to start life afresh but the pressure on land can be lessened and the over-crowding in the country-side diminished. For this purpose, a colonisation scheme under State aegis must be carried out, wherever debt conciliation is put through. Such colonisation has been successfully carried out recently in Germany, Italy and Canada, and the burden of the scheme is shared between the State, municipalities, land mortgage banks and voluntary associations. All migration need not be within the country; rather in the present circumstances, it would be worth while sending out colonists to new lands, so that the rural congestion may be diminished.

III

Preventive Measures

To extricate agriculturists from indebtedness without guarding against a relapse into debt is a sheer waste of effort. Let all debt be wiped out by a fiat of Government to-day, and tomorrow debt will be born again and will soon grow into its former size—provided those who have money to lend have not been scared away in the meantime by the arbitrary action of Government. It is foolish to think that agricultural indebtedness can be cured by merely extinguishing the existing debt. The only effective means of controlling debt is to fortify the agriculturist against future debt. This cannot be done effectively by keeping a strict watch over moneylenders, nor by lowering rates of interest, but it can be done, to a great extent, by adopting a system of rural credit which is self-liquidating. If, for instance, the bulk of the rural debt is raised for productive purposes and if a careful distinction is

made between long-term and short-term purposes, and if short-term credit is in such amounts as can be repaid at the following harvest and if long-term credits are raised from land mortgage banks or similar institutions which allow equated or even graduated payments of convenient size, then debt can be kept under control and indebtedness can be greatly reduced. The co-operative society was expected to cure debt, but it has proved itself incapable of doing so, greatly because the co-operative society attempted to do mainly the work of lending money. If co-operation is to keep down indebtedness it must be able to fulfil a more comprehensive purpose. It must first and foremost increase the income of the ryot by better tillage and better marketing, and must curb social expenditure, and inculcate thrift. Loans must be given for productive purposes and in such form and manner as to be so used; and when the harvest is gathered, the society itself must take charge of the produce and market it in the most profitable manner and pay interest and taxes. To avoid grain loans from usurers at high rates of interest, the co-operative society must itself conduct a grain bank, on the lines of the grain golas of Chota Nagpur.[1] By such a policy, the ryot is assured of a more stable income; and the society is assured of punctual repayment. Such co-operative experiments have already been made in different parts of the country, and it is time their experiences were garnered, so that a new co-operative policy may be devised for the whole country.

The best way of fortifying the ryot against debt is to increase his income, and cure him of his improvident ways; but in some countries efforts have been made by legislation to insure property against incumbrance and consequent alienation. The system best known in India is that of non-alienability of land, and this obtains in the Punjab, Bandelkhand, the Central Areas and parts of Central Provinces. The Punjab Act of 1901, on which others are modelled, forbids the alienation of land to non-agricultural tribes. Its object was to fortify the agriculturist against alienation, but that has not been secured, seeing that the Act has stimulated the rise of a growing class of agriculturist moneylenders; it is curious to note that moneylenders have newly arisen even among

[1] B. & O. Banking Report, p. 119.

the Gonds of the Central Provinces. As land can pass only to agriculturist classes, agriculturist moneylenders are always willing to advance larger sums on land security than the non-agriculturist moneylenders, and this has only facilitated land transfers from peasants to large landowners. On the other hand, the credit of the ryot has been restricted, and unless such impediments to the free transfer of land are removed, non-agriculturist lenders are bound to demand high rates of interest and land mortgage banks will not be able to operate freely, nor raise their working capital through debentures on reasonable terms. The Indian Banking Committee has therefore recommended that Land Alienation Acts should be modified if land mortgage banking is to develop rapidly.[1]

On a different footing are laws made to ensure a minimum holding to agricultural families. As is well-known, in a country which depends so little on non-agricultural occupations, an increase in the number of landless agriculturists is attended with many serious social and economic consequences, and it would certainly be desirable to prevent agricultural families from losing at least such portions of their property as are essential for their shelter and maintenance. Hence the 'Homestead' Law of the U.S.A., the 'Heimstatten' laws of Central Europe and the 'Five-Feddan' law of Egypt. In those countries, such minimum holdings are also protected by law from being subdivided.

There is no doubt that such a policy would be desirable for India also, but there are various difficulties standing in the way of its adoption. As already shown, the *per capita* holding of land among agriculturists is very small and even if we take the cultivating owners and tenants, the average holding is only $4\frac{1}{2}$ acres. Indeed it would be exceedingly difficult to define an 'economic' holding, but except in the wet tracts and where special commercial crops are grown, even a holding of 5 acres may be uneconomic, and therefore if law insists on 'economic' holdings, it would involve the rise of a landless proletariat, which must be a grave social menace in a country where trade and industry are so little developed. Nor is there much land fit for colonization in many provinces. It would also lead to much family strife and litigation and in

[1] Report, pp. 175-76.

this the example of Continental Europe is rather a warning than an encouragement. Inalienability of holdings would restrict credit and lead moneylenders to resort to worse means of exploitation. Above all, it would go against the social system of Hindus and Muhammadans, and only a powerful Government could carry out such radical reforms.[1]

However, considering the evils of frequent land-alienations, something must be done to prevent family property from being alienated, and with growing opportunities for trade and industry in the country and with the increase of migrations, the possibilities for making a minimum holding inalienable may grow stronger and it may soon become necessary to carry out legislation in the matter.

Other methods have often been proposed for checking the growth of mortgage indebtedness and for preventing land from passing hands frequently. This subject raised a controversy in Europe 30 years ago, and from it arose the idea of incorporating all landed property in a district and making future borrowing dependent on the common consent of all the land-owners. Schemes were proposed for this purpose by Robertson, Barou Von Vogelsang, Lorenz Von Stein and Schaeffle. The formation of such corporations of landed proprietors may indeed help in lightening debt burdens and for preventing property from passing hands among individuals, but it could not prevent property passing to the Corporation itself. That would result in the conversion of owners into tenants and labourers, and they could never hope to rise to their former status.[2]

The fundamental weakness of all such measures which discourage alienation of land is that they go against the grain of human nature. The incentive to enterprise to-day comes from the possibility of hardworking small-holders becoming substantial landowners in course of time. What the lazy and improvident landlord loses, the thrifty and hardworking peasant gains, and society does not lose by such changes. Nothing is gained by keeping landed property in a few hands all the time. The law of life is change, and as things are

[1] On these same grounds, attempts at remedying the subdivision and fragmentation of holdings are likely to meet with opposition. See Royal Commission on Agriculture Report, p. 137.

[2] Boyazoglu, *Agricultural Credit*, pp. 158–62.

to-day, to prevent change may mean stagnation. Indeed too frequent transfers of land may be an evil, especially in a country so greatly depending on agriculture; but while remedying that state of things, we need not go to the opposite extreme of rewarding incompetence and penalising enterprise.

IX

Conclusion

It is clear from the foregoing that there is no panacea for the cure of indebtedness. It is a chronic disease in India and is complicated by the interaction of numerous social, economic and religious forces, which cannot be easily controlled. Indeed there are various ways of giving temporary relief, but unless it is accompanied by the establishment of an improved system of rural credit and agricultural economy, it will only mean a Sisyphean task for Government. The new system must be one of controlled credit, one which will provide adequate credit on reasonable terms without demoralizing the recipients, one capable of resisting the temptations to improvident borrowing, and above all one which would increase the repaying capacity of the borrower and inculcate thrift in him.

There is a vicious circle—perhaps there are many vicious circles—involved in the whole problem. Without removing the evil of debt, agricultural improvement on a wide scale is impossible; but without improving agriculture there is little chance of indebtedness being eradicated. Similarly, improvident social expenditure is not merely a cause of indebtedness, but it is also a result of it. In fact, poverty, low standard of living, improvident expenditure, debt and disease—all these react upon one another and they are all inextricably intertwined. This large vicious circle must be broken at various points, and a simultaneous advance in many directions must be attempted. That requires the intimate co-operation of the various agencies that work for the economic, moral, social, intellectual and sanitary amelioration of the country. Above all, in these efforts, an intimate co-operation between the Government and the people is quite necessary. Government alone can do little to curb improvident social expenditure, and to increase agricultural income; and people without the support of Government can do even less in that direction. A

powerful Government enjoying the support of the whole community can effectively root out the social and economic ills of India. Not only Government but all religious organisations must be harnessed for this purpose. The Christian missionary bodies have already shown that under religious inspiration economic amelioration can be effectively carried out, and if other religious organisations also come into line, and take their proper place in the fight against debt and disease, the economic progress of India would be greatly accelerated.

The remedial action suggested in this paper may now be summarized. In all parts of the country where indebtedness is a serious problem—and this is to be decided by local enquiry—a scheme of debt conciliation must be carried out under the immediate supervision of Government. It will be found that a certain number of agriculturists can be redeemed from debt by their giving up part of their land or by land mortgage banks taking over their debt and receiving from them convenient instalments spread over a number of years. In the case of many of those people whose property is not sufficient to redeem their debt even after it has been cut down by the conciliation board, the best solution would be for them to give up their land and migrate either to industrial centres or to new lands awaiting colonization. For this purpose, a migration scheme under Government control must be carried out, with the aid of local bodies and charitable associations. Working hand in hand with this, there must also be a plan of rural development, which would make provision for an improved system of rural credit. To all who have been redeemed from debt and to others who want to avoid debt, the co-operative society and the land mortgage bank must be the principal agencies of credit. All short-term credit must be supplied by the co-operative society, and it must be a charge on the borrower's produce. The society must market the produce, and from the sale proceeds, it must pay its own dues and the instalments of the land mortgage bank, and if possible even the land revenue. Wherever necessary, the society must conduct a grain bank for helping ryots in times of scarcity. Loans for unproductive purposes must be strictly limited and must on no account be larger than the borrower could easily repay at the following harvest. A vigorous educational propaganda on a nation-wide scale must be carried out for eradicating extravagant social expenditure, and in this the village panchayat

may serve as a powerful agency. The co-operative society will not only advance loans but will also work for agricultural improvement, and for this purpose every society must obtain advice from expert guides who may be appointed by District Boards or other local bodies. This may also be a means of regulating agricultural production with an eye to the requirements of Indian industries and export trade.

Thus the scheme of debt redemption must be an integral part of a planned rural development and must include (1) debt conciliation, (2) emigration from congested areas, (3) establishment of co-operative societies in every village, and land mortgage banks in larger territorial units, (4) a system of co-operative marketing, and (5) above all, a concerted move for agricultural improvement. The scheme must be put into operation as a whole, and it may do little good if one part is detached and given effect to. To redeem people from debt without devising means for avoiding future debt will be of no great use. Similarly to talk of agricultural improvement when the agriculturist is loaded with a heavy burden of debt is futile. The preventive as well as the curative treatment must be put through simultaneously.

However, let us not be inactive, because time is not ready for putting into operation a comprehensive scheme. As the Royal Commission on Agriculture wrote, 'the worst policy towards debt is to ignore it and do nothing'. This is particularly true of the present time. There has been an unprecedented rise in the value of money, and this has hit the debtors hard. A large number of agriculturists have been plunged into the slough of despond by the unbearable burden of their debt. Such a situation should be carefully handled. The Macmillan Committee Report says: 'A study of history, we believe, confirms the opinion that it is in the changes in the level of prices, and in the consequential alteration in the position of debtors and creditors, entrepreneurs and workers, peasants and the tax-gatherers that the main secret of social trouble is to be found'. Indeed the situation may not have become menacing in most parts of India, but when money-lenders begin to foreclose, it is possible that widespread social unrest may arise. Political unrest is bad enough, and to aggravate it by social discontent is dangerous. The following words of Lord Morley have a special meaning just now:— 'Great economic and social forces flow with tidal sweep over

communities only half conscious of that which is befalling them. Wise statesmen are those who foresee what time is thus bringing and try to shape institutions and to mould men's thought in accordance with the change that is saliently surrounding them.'

प्रक्षाळनादि पङ्कस्य ।
दूरादस्पर्शनं वरम् ॥

APPENDIX A

HAS THE GRAVITY OF INDEBTEDNESS BEEN EXAGGERATED?

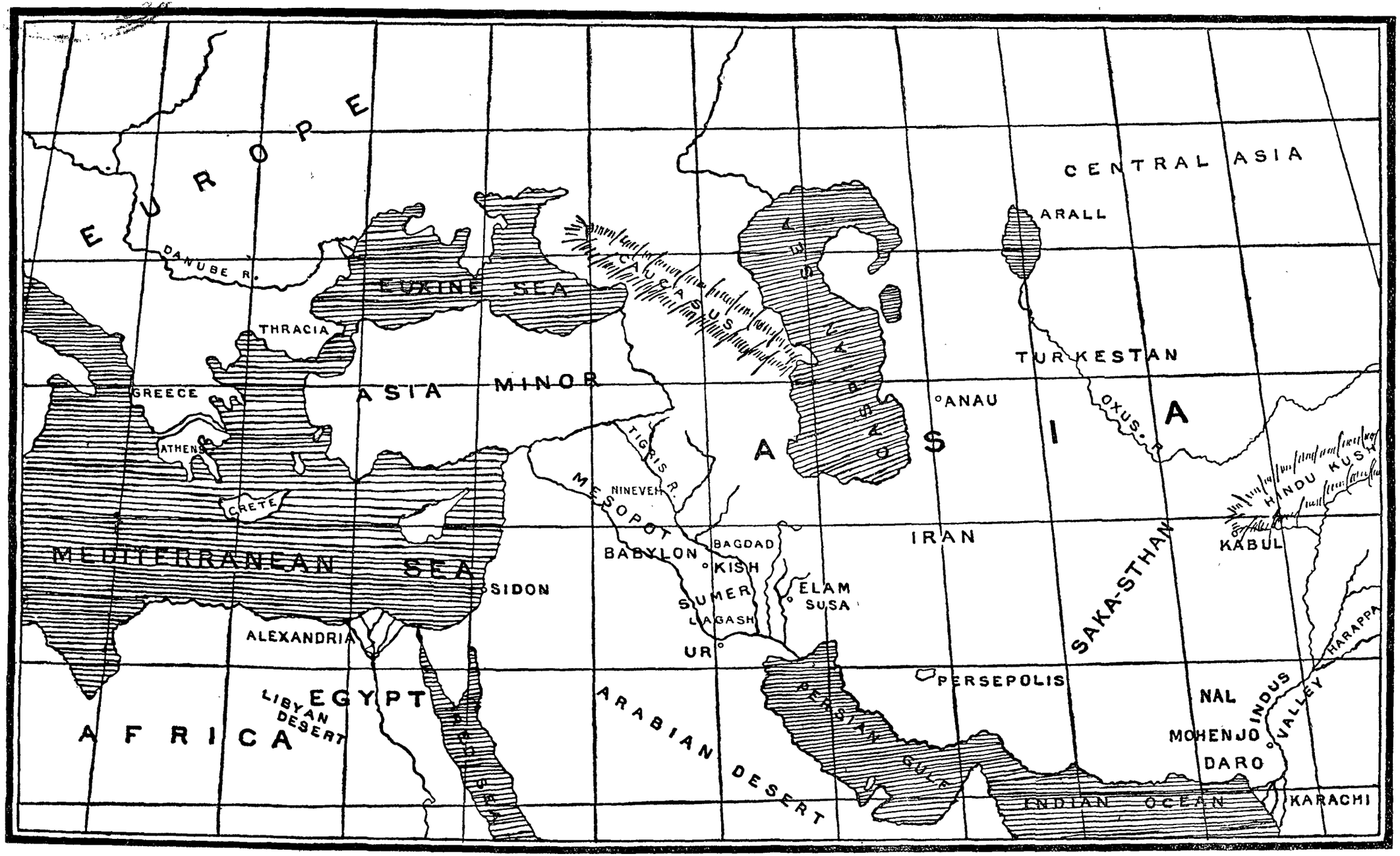
It is sometimes pointed out that indebtedness is not so serious an evil in India as often made out to be. The principal grounds for this view seem to be:—(1) Debt is not necessarily a sign of poverty; it increases when production increases, and therefore it may be a sign of progress; (2) the profits of moneylenders are grossly exaggerated.

1. Those who take the first line of argument forget the purpose for which Indian agriculturists raise their loans. To borrow large sums of money for productive purposes is desirable, but such is not the nature of the indebtedness piled up for unproductive or seemingly productive purposes by Indian agriculturists. Had their borrowings been mainly for agricultural purposes, and had they been in such amounts as to be repaid from the results of their production, there would not have been much cause for anxiety. But admittedly, it is not so. Indeed the farmers of England and America borrow large sums of money, but they raise those sums mostly for agricultural purposes. Hence the difference between the credits raised by those and the unproductive borrowings of the Indian peasant.

Nor is there any point in the analogy sometimes drawn between the borrowings by the large industrial corporations and by agriculturists. The total borrowings of industrial firms in England or U.S.A. must be a colossal figure, but no one objects to such debt. Why then, it is asked, take such pains to estimate the total debt of Indian agriculturists? The answer to this question is, first, that the purpose for which debt is raised makes all the difference in the world, and as already shown, there is no analogy between industrial borrowings, however speculative, and the borrowings of the impecunious and improvident peasants of India and China.

Secondly, the loss that industrial ventures incur is generally borne by a large number of shareholders or partners who invest only a part of their money in such undertakings; and therefore even if the firm collapses, the loss to individuals may not be serious. The peasant, on the other hand, puts all his earnings into his one business, and borrows on the security on his land, which is his mainstay. If by incurring debt he loses his land, not only he but his family and dependants will be put to great hardship. An increase of landless men, in the present circumstances, is bound to increase social discontent. Moreover, the peasant is generally an ignorant man and is not generally able to safeguard his interests when he deals with shrewd moneylenders. He does not accurately estimate the financial results of his borrowings and is therefore likely to borrow more than he safely could, and on terms unfavourable to him. Hence the importance attached to agricultural credit in most countries and the careful scrutiny by Government of the terms of agricultural loans and the total accumulated debt from time to time. It should be unnecessary at this time of day to justify such action.

2. As for the contention that the net earnings of moneylenders are not as high as generally believed, it is beside the point. Indeed where moneylending is of a speculative nature—and lending on personal credit to landless agricultural workers must be greatly speculative—it is but natural that some of the transactions should result in loss. Speculation may result in great gains or great losses, and it must be because their gains are greater than the losses that the moneylenders venture on speculative transactions. And an enquiry into the total wealth of some of the moneylending classes will show that they are not the worse off for it. The point to be noted is that the interest charged by moneylenders for loans to agriculturists is too high, and that agriculture as an occupation, is not able to bear such high interest charges. It may be that some of these loans are never repaid, but the question is whether the honest agriculturists—and they are the majority—have to pay these high rates of interest. They have got to, and they do so, often by encroaching on their wages. So long as such high interest payments continue, agriculture in this country cannot prosper. The fault is not entirely the moneylender's: it is the fault of the entire system, and if this state of things is to improve, the risks of agriculture must be reduced, rural credit must be placed on a secure footing and the moneylending classes must be satisfied with a smaller, but surer, return.



MAP SHOWING THE INDUS VALLEY, MESOPOTAMIA AND EGYPT.

THE CULTURE OF THE INDUS VALLEY

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THE AUTHORS OF THE CULTURE

An official account of the results of the Archæological excavations at Mohenjo Daro carried out by the Government of India between the years 1922 and 1927 has been published in three volumes under the able editorship of Sir John Marshall, late Director-General of Archæology in India (Arthur Probsthian, London, 1931). The spade of the archæologist has revealed to us the monuments of the pre-historic Indian civilisation in the region of the Indus Valley in the Chalcolithic stage of culture—a period of transition between the Stone and Metal ages. These monuments and remains have been the subject of interesting studies at the hands of scholars, Indian and European, in respect of chronology as well as the worship and culture, which have been flourishing in the Indus region for centuries and have left behind unmistakable traces in the numerous and varied finds brought to light in the course of a decade. Though there is a large difference of opinion as to the nature and character of these discoveries, and consequently the date to be assigned to the culture, the major point at issue centres round its author. Though in the nature of things it may be proper to discuss the authorship of this civilisation towards the end of this essay, yet for the sake of convenience we shall take up this first for examination, and then examine the worship and culture, and lastly the date.

Various theories on the question of the authors of the Indus civilisation hold the field. In his learned and suggestive book, *The Ancient History of the Near East,* H. R. Hall launched with caution a plausible theory of Sumerian origins in the Indus Valley, years before the recent archæological

discoveries here. He said that the ancient Sumerians bore most resemblance to the Dravidian ethnic type of India, and that they left on the way the seeds of their culture in Elam.[1] (pp. 173-4, fifth ed. 1929.)[2]

Another scholar, L. A. Waddell, who has to his credit many interesting studies on the subject of the Sumerian origins, comes to the only possible conclusion according to him, that the Sumerians were Aryans.[3] The theory of Prof. G. Elliot Smith connecting the Sumerians with the brunette Mediterraneans has not found general acceptance with scholars.[4]

Though there are two definite theories about the Sumerians as the Dravidians and as the Aryans, still we shall turn to the Indus Valley and see whether the people of that region in the Chalcolithic period and earlier were those who were immigrants to Sumer. Colonel Sewell and Dr. Guha discuss in Chapter XXX the human remains, which, according to these learned scholars, comprise four ethnic types, viz., Proto-Australoid, Mediterranean, Mongolian and the Alpine. Thus they seem to belong not to one fixed period but to different periods of time. There are on the whole 26 skeletons. Of the third and fourth types there is only one specimen while there are six examples of the Mediterranean race. The different skulls of which twelve are well preserved are put to a searching examination in respect of their measurements and cranial capacity. The authors conclude that the skulls are 'not a homogeneous series'.[5] This points then to the heterogeneous character of the population in Mohenjo Daro and Harappa. This cosmopolitan character of the

[1] *Note.*—' The name "Ilam" is applied to the whole mountain massif forming part of the watershed range between the Karākar and Jaosu passes ', identified with Hieun Tsang's Mount *Hilo* (pp. 100 and 102 of *Memoirs of the Archæological Survey of India*, No. 42.)

[2] In favour of the Indian origin of the Sumerian culture Professor V. Rangachari invites our attention (1) to the use of cotton which was named ' sindham ' or sindhu, (2) Indian beads in Mesopotamia, (3) Pottery, though Codrington believes that India was the borrower in this respect. *Pre-Musalman India*, I, pp. 189-90. See also R. Banerjee, *Modern Review*, 1924, p. 673.

[3] See, for instance, his works : *The Indo-Sumerian Seals Deciphered* (1925), *A Sumar-Aryan Dictionary* (1927), *The Makers of Civilisation* (1929).

[4] See *The Ancient Egyptians*, pp. 139-44 ; see also for different theories : *The Quarterly Journal of the Mythic Society*, April 1929, and October 1932 : H. R. Hall : *op. cit.* p. 174 and the foot-notes thereon. Gordon Childe : *The Aryans*, p. 35. Marshall : *Mohenjo Daro and the Indus Civilisation*, Vol. I, pp. 109 ff ; *Cambridge History of India*, Vol. I, p. 43 ; H. G. Wells : *The Outline of History*, p. 174.

[5] *Mohenjo Daro and the Indus Culture*, Vol. II, Chap. XXX.

Indus people shows a fairly high stage of culture and baffles the students of race and anthropology from fixing any definite chronological limits.

Sir John Marshall, who has given some thought to this question, is of opinion that the Indus people of the Chalcolithic period were pre-Aryan people and therefore of the Dravidian stock.[1] The learned archæologist takes it for granted that, (1) the Aryans were not autochthones[2] and (2) that the composition of the Rig Veda Samhitā was about 1500 B.C.,[3] and proceeds on such assumptions to compare the Indus and Vedic cultures showing thereby that they were unrelated. To give a summary account of his statements:

(1)[4] The Vedic Aryans are still villagers largely and they are ignorant of the amenities of city life.

(2) The use of iron for defensive armour and offensive weapons is unknown to the Indus people.

(3) The Indus people were fish-eaters and the Vedic Aryans who were meat-eaters did not use fish for diet.

(4) The horse is unknown to the Indus people but it is used by the Vedic Aryans.

(5) While the cow forms the object of worship with the Vedic Aryans, the Indus people attach importance and value to the bull.

(6) The Indus people were iconoclasts but the Vedic religion is aniconic.

(7) The Indus Cults of the Mother Goddess and Śiva are not prominent in the Vedas, which give prominence to the fire-cult.

(8) The phallic worship which is not recommended by the Vedic texts occupies the attention of the Indus people.

Let us proceed to examine the above categorical statements and see whether the relations between the Indus people

[1] See also R. Chanda, *Memoirs of the Archæological Survey of India, No.* 41.

[2] *Contra.* A. C. Das : *Rig Vedic Culture* (1925), pp. 48 ff ; pp. 173 ff.

[3] Prof. Jacobi's estimate of the composition of the Rig Veda on the evidence of astronomical data about 4500 B.C. is modest enough and was acceptable to indologists like Prof. Zimmermann and Dr. Bühler. This nullifies the late Maxmüller's conjectural dating, since much water has flown under the bridge of Indian research.

[4] *Op. cit.*, Vol. I, pp. 110–111.

and the Vedic Aryans were distinctly different as we are made to believe. As regards the non-existence of life in cities in the age of the *Rig Veda*, we can invite the attention of the reader to a significant expression *Pūr* in the *Saṁhitā*. As Pischel and Geldner held, the *Pura*, or *Puram*, incontestably refers to cities and that fortified cities. It cannot be as the authors of the Vedic Index surmise,[1] that *every grāma* or village had a fortification round it. Again, the capture of *grāmas* and their destruction by the Aryan hosts cannot be regarded as a special feat of chivalry or heroism on the part of a conquering monarch. The reference is therefore to fortified towns, and if we are to believe the tradition transmitted in the *Arthaśāstra* literature only capital cities and perhaps other important ones were fortified. For in those days fortifications were the only effective source of defence against the invading enemy. But it is true that we have no details furnished as to the amenities of city life. This does not mean that the Rig Vedic Aryans had not yet emerged from the village state but it does mean that their life was simple and plain enough.

The contention of the archæologist that iron had not come into use in the age of the *Rig Veda* can be accepted and as Dr. N. N. Law has remarked 'this is rather a similarity between the Indus Valley and the Rig Vedic civilization and not a point of difference.'[2] The writer in the *Cambridge History of India*, Vol. I, concludes that the term *ayas* meant copper. But the term *Syama Ayas* is interpreted with some justification as black copper and it must be a reference to iron. Be it noted that this term occurs only in the *Yajur Veda* and *Atharva Veda* but unknown to the *Rig Veda*.[3] This rare use of iron and the larger use of copper in the Rig Vedic period go to prove that the Indus civilization is perhaps a lineal descendant of the Vedic culture. This means that the Stone Age in N. India was succeeded by Copper Age and Iron Age respectively. On the other hand the Dravidian finds in South India show the Iron Age succeeding the Stone, without the intervening Copper.[4] From the extravagant use of copper (even

[1] Vol. I, pp. 539 f.
[2] *I.H.Q.*, VIII, p. 158.
[3] P. 56.
[4] *Ibid.* Cp. Crooke: *Religion and Folklore of Northern India* (1926), p 287.

weapons of offence like arrows and maces were made of copper) and the little or no use of iron it can be held to be established beyond doubt that the type of civilization represented by Mohenjo Daro cannot be pre-Aryan but only Aryan. If it is pre-Aryan or Dravidian as is alleged we should have abundant use of iron in evidence.

The third argument cannot be taken seriously. Once it is granted that the Vedic Aryans were meat-eaters and not vegetarians, we can include fish as an article of diet. There is certainly a reference to fish being caught. Or it may be that fish-eating was a later introduction in the Chalcolithic period. In any case this is *argumentum ex silentium*.

As regards the horse, its existence cannot be totally denied in Mohenjo Daro. Colonel Sewell and Guha compare the specimens of the horse discovered and conclude: 'It will be seen that there is a considerable degree of similarity between these various examples, and it is probable that the Anau horse, the Mohenjodaro horse and the example of Equus Caballus of the Zoological Survey of India, are all of the type of the Indian "countrybred", a small breed of horse, the Anau horse being slightly smaller than the others.'[1] It may be that some day we light upon an express portrayal of this animal on the seals.

The statement that the bull is held to be more sacred than the cow must be modified and it may be contended that both the bull and the cow were venerated. If the bull cult was prominent, it was because the Indus people were worshippers of Śiva whose riding animal was the bull, as is testified to by the earliest Purāṇas. If the bull is sacred to Śiva, the cow its mother evokes veneration as the mother goddess in Mohenjo Daro.[2] This is in keeping with the statements in the Vedic texts that the cow is *Yami* and *Sahasratami*. The latter is the *Kāmadhenu*, the mother of cattle kingdom. The bull, like the cow, served the sacrificial fee, Dakṣiṇa in the Vedic literature. We have again the authority of Prof. Macdonell that Indra in the *Rig Veda* is constantly designated as a bull. In one of the sacrifices of the Vedic ritual a bull represents the god Rudra.[3]

[1] *Op. cit.*, Vol. II, pp. 653–4.
[2] *Op. cit.*, Vol. I, p. 339.
[3] See *Vedic Mythology*, p. 150.

Dr. N. N. Law thinks that the inferred representation of the tiger on the seals is a reference to a hyæna (*śālāvṛka*) of the *Rig Veda*. If it is tiger the Indus Valley civilization is contemporaneous with the *Taittirīya Saṁhitā* and the *Atharva Veda* where the animal figures. In this respect again the Indus culture must be a successor to the Rig Vedic culture. It is again proved from the terms *vārana* and *hastin* that elephant was known to the Rig Vedic Aryans.[1]

It is true to a great extent that the Vedic religion was aniconic. The worship of icons followed the Vedic culture and in this respect the Indus culture can be said logically to follow the Vedic religion. The worship of the Gods of the Vedic pantheon gradually resulted in the evolution of cults, and a definite system of image worship came into being with the ushering in of the Vedic period. For example an image of Indra is mentioned.[2] Interrelated with the above are the arguments 7 and 8. Śiva came to be identified with the Vedic Rudra, and the consort of Śiva was Śakti, the Mother Goddess. In an age of the worship of icons the phallic worship came in the wake of the worship of Śiva who seems to have been the favoured deity of the Indus people. More of this later on.

If we once again traverse the foregoing few paragraphs we come to the conclusion that the monuments and remains of the Indus culture reveal an advanced state of civilisation when compared with the simple Vedic civilisation. Perhaps the age of the *Rigveda Saṁhitā* was over and the Chalcolithic culture was on a par with the age of the *Yajur Veda* and *Atharva Veda*. If these facts may be held to be established we can conclude that the Vedic culture in its earlier form preceded the Indus culture. This leads us on to postulate the theory that the Indus people of the Chalcolithic period were Vedic Aryans, as several scholars hold.[3] But if it is the other way about as others maintain, how are we to explain the fact that city life became extinct and was substituted by the village life, and that the worship of image gave place to the worship of the elephants. In the progressive state of human history it

[1] *I.H.Q.*, VIII, pp. 160–61.
[2] *C.H.I.*, pp. 97, 106.
[3] See also N. B. Pavgee: The *Aryavartic Home and its Arctic Colonies*; A. C. Das: *Rig Vedic India* (2nd ed.), pp. 379ff.; Sir W. Raleigh: *History of the World*; Har Bilas Sarda: *Hindu Superiority*.

will be illogical that the most edifying aspects of a glorious civilisation completely disappear, and their place is taken by the more simple rudiments of Vedic civilisation as the scholars seem to believe.

The next question then centres round the facts whether these Indus people went to Sumer, Babylonia, and other parts of the Ancient world and settled then and there. Or whether there was a sweep of immigrants from these places to the Indus region. There is a consensus of opinion among the archæologists who are authorities on the Ancient History of the Near East that the first alternative is the more probable, in the light of the comparison of the finds discovered in Elam, Mongolia, Sumer, Babylonia and Egypt. The wonderful agreement in respect of pottery, seals, writing, human remains, worship of figurines and animals must lead one to the conclusion, which H. R. Hall threw out as a mere suggestion with keen forethought and caution, that one must look for the origins in the Indus Valley of the Indian continent.

PHILOSOPHY AND RELIGION OF THE INDUS PEOPLE

What most strikes a student of philosophy and religion in this region in the period under survey are 'two marble statuettes with head, neck and body quite erect, and half-shut eyes fixed on the tip of the nose' exactly in the posture of one engaged in practising *yoga*.[1] Other interesting finds which throw new light on the religion of that ancient epoch are figures and figurines of Śiva, Mother Goddess, ring stones in the form of *linga*, worship of trees, animals, water and a number of votive offerings. Archæologists and scholars who have examined these finds have come to the conclusion that these betray influences and ideals of pre-Vedic culture, and that the institution of *yoga* as well as *śaivism* are non-Vedic, and hence prior to the epoch of the Vedas or the Hindu Revealed Texts. The points raised are controversial in nature and the theories are framed as mere guesswork. Let me re-examine this position and see whether such theories are tenable and plausible.

[1] See R. Chanda: *Memoirs of the Archæological Survey of India*, 41, Part I.

To observe that the institution of *yoga* is non-Vedic is to say the least, unconvincing. According to the orthodox theories of the origin of the man and the world, the first man who is hence styled as Manu was created by the Lord, and from him sprang up other men, sages, and seers, the progenitors of men, beasts, birds, worms, and even the vegetable kingdom. These early 'men' saw around them waters and plants, and other elements. They began to study their own bodies and found them composed of *pañcabhūtams* or five elements, the ether, water, air, fire and earth. They engaged themselves in a comprehensive study of these elements in relation to their bodies and tried to find out the means to get rid of the body and attain oneness with the Supreme Being. This resulted in the six limbs of the *yoga* system : *mūlādānam, svātiṣṭānam, maṇipūraṇam, anāhatam, viśuddhi* and *ājñai.* This means that when the ancient seers put these to rigid test they found that without *ājñai* or the last limb which was the symbol of *śakti* the first five could not function and hence evolved the cult of Śivaśakti. This Śiva or Sadāśiva, as we could understand today by the term, was the Supreme *Puruṣa* who possessed five faces representing *Sṛṣṭi* (Creation), *Stithi* (Existence), *Samhāram* (Destruction), *Tirodānam* (Disappearance) and *Anugraham* (Sympathetic Grace). Yet something was found lacking to supplement this *Puruṣa* by giving Him effective power to function in the proper way. This was supplied by the Power God or to be more exact the goddess, Śakti, the Mother Goddess of Mohenjodaro. For has it not been beautifully said by Śri Śaṅkarācārya in his immortal work *Soundarya Lahari*—

'Śiva śaktyā yuktah atibhavati śakataḥ,'

meaning that Śiva becomes really śakta, the powerful, when He is with Śakti, the Mother of Goddess. In this way Śivaśakti was realised by the early sages, the *Yatis* of the *Rig Veda Saṁhitā,* in order to realise the *yoga*[1] and free themselves from the trammels of this world. In the *Rig Veda* VIII, 3, 9 we hear Indra, the Lord of Heaven extending succour to these *yatis* among whom figure the sages who go by the name of Bhṛgus. These latter praise Indra in their turn. In fact these

[1] *R.V.*, X, 136.

are those who have realised the Yogic perception and hence equal to the Gods. For in the same *Saṁhitā*, x, 72, 7, are not these *Yatis* deified?

But this state of things can be applicable only to a limited few. In course of time men grew in numbers and society became enlarged and a settled order of things came into being. This stage of religious culture is represented by the *Taittirīya Saṁhitā* and the later Vedic literature. For the orderly progress of the world (the *yogakṣema* of the *Arthaśāstra literature*) the *yati* life did not and would not suit. They wanted a system of elaborate forms of worship by means of rituals, ceremonies, and sacrifices. In other words the ancient people began to worship personal beings instead of the Impersonal realised in their *yoga* form. This is the scientific interpretation of the two *panthas* or ways of the *Upaniṣads*, the way of *Vidyā* (*devalokam*) and the way of *Karmā* (*pitṛlokam.*)[1] The followers of the way of *Vidyā* are the *Yatis* of the Rig Veda and of Mohenjodaro who died hard in spite of the vigorous advocacy of sacrificial rites in the *Yajur Veda Saṁhitā*. The legend in this Saṁhitā, and the later works to the effect that the *Yatis* became the foes of Indra who had them punished by their being given away to the hyænas (*śālāvṛkas*)[2] is only a reference, as the commentators show to the *yatis* fallen from their *svadharma* and not of the *yati* class in general as Mr. R. Chanda seems to explain.[3] The implication is that Indra, as the Lord of Heaven, punished such refractory sages perhaps to strike terror in the minds of others to conduct themselves clean and pure in body and mind. The fact of the matter is that men who took to a life of renunciation and complete self-control, though they formed a minority, continued the old modes of worship by the contemplation and meditation of the Supreme Impersonal God and lived in forests or the outskirts of the cities and villages. Those who lived in the latter places took to the worship of personal gods whom they conceived to live in animals, trees, and other elements like water. These were propitiated by offerings, as is largely evident in the monuments of Mohenjodaro as we shall see below.

[1] *Bṛhadāraṇyaka* VI, 2, 15 and 16. Ed. by Basu (1916).
[2] II, 4, 9; VI, 2, 7: Ait. Br. VII, 28: *Pañcaviṁśa Brāhmaṇa*, VIII, 1, 4.
[3] See in this connection J. W. Haws: *Dar Vrātya* (1927).

This is the stage of culture portrayed in the Indus region of the Chalcolithic and even early period. Commenting on the statues in an attitude of *yoga*, Sir John Marshall observes: 'That it possessed a religious or quasi-religious character is suggested by the distinctive trefoil patterning of its robe—a motif which in Sumer is reserved for objects of a sacred nature. . . Śiva is not only prince of Yogis: he is also lord of the beasts (Paśupati); and it is seemingly in reference to this aspect of his nature that the four animals—the elephant, tiger, rhinoceros, and buffalo—are grouped about him. . . Rudra, the Vedic God, whose cult was amalgamated and identified with that of Śiva, also bore the title of Paśupati. . . An instructive parallel to this aspect of the duty is furnished by the nameless God and Goddess of Minoan Crete, who are frequently figured on the monuments in company with lions or leopards and have come to be known as the master and mistress of animals. The Anatolian Cybele, too, who is analogous to the great Mother Mahādēvī—the consort of Śiva—was similarly supported by lions.'[1] We recognise in the horns crowning his head, the *iriśūla* or trident. From these we are led to conjecture that the original form of the *yoga* was simple, the *pāśupata* form which consists of a rigid practice of *prāṇāyāma* as is elaborately described in the *Vāyumahāpurāṇa* discussed elsewhere.[2] Suffice to say here that the description of the posture as furnished by the Purāṇa is exactly the same as we find in the marble statues of Mohenjodaro.

Apparently from the *Pāśupata* form of *Yoga*, Śiva came to be known as Paśupati. The Paśupati-śiva is the direct outcome of this transition from the epoch of the *Yoga* to that of the sacrificial deity, Rudra. It is remarked however that the absence of the bull (*nandi*) in the seal shows that it is pre-Aryan Śiva. It may be that in a particular seal or seals, the bull may not be found. But we cannot explain it away easily or conclusively for the matter of that, since the cult of the bull is so distinct and so elaborate. We are led to conjecture that if the bull-cult attained so much importance in that age, it was due to the fact that it came to be recognised even

[1] *Op. cit.*, Vol. I, p. 54.
[2] See Author's *Aspects of the Vāyu Purāṇa*, 'Madras University Journal,' 1932.

then the riding animal of Śiva. Otherwise there is no meaning in the widespread cult of the bull. Added to this fact is the *linga* cult, 'the mystic phallic symbol of creation'. There has been a war of words whether phallism is represented in the Vedic texts. From the term *Śiśna Devas* occurring in the *Rig Veda Saṁhitā*[1] it is inferred that the worship of the phallus was known to that earliest work now extant.[2] The term *śiśnadevas* is interpreted as *abrahmacaris* and one has to look for their identification with the fallen *yatis*, the foes of Indra whom we referred to above.[3] Thus the fireless cult of *yoga* gave place to the fire cult of the *Yajña*. It must be remembered in this connection that *Yoga* is also a *Karmā* and is called *Mānasi-Kriyā*. In the same strain the *Bhagavad Gītā* speaks

'Yogak-Karmasu Kauśalam.'

As *yoga* forms a part of *Karmā*, there can be no conflict between the followers of *Yoga* school and *Karmā* school, and therefore Indra, the deity of *Karma*, cannot be inimical to *Yatis*, who practised *Yoga* which is alleged a part of that *Karmā*.

The other phallic emblem, the *Yoni*, specimens of which are reproduced in the valuable volumes edited by Sir John Marshall is a clear indication of the cult of the Mother Goddess which Indian religious literature would style *Śaktism*. We do not jump to the conclusion that the cult of *śaktism* as understood by the later *Āgamas* was already prevailing in the Chalcolithic period. But the seeds of the cult were sown there in a rather philosophical spirit. The six limbs of the *Yoga* referred to above are, according to the *Yogaśāstra*, the six eccentric circles or *cakras*, the presiding deity of which is śakti or the Mother Goddess. Though in fact the *Yoga* literature came to identify every limb of the *Yoga* with *śakti*, the original form of it, the real driving force was supplied by the last, the *ājñai*, which is supposed to have its locus standi in the forehead of the human beings. These Mother Goddesses who are styled in the later Purāṇa literature as *lokamātas* represented as the *Prakṛti* which in union with *Puruṣa* served the creative principles of life. Among these

[1] VII, 29, 5; X, 99, 3—see also *Nirukta*, IV, 19.
[2] See A. C. Das, *op. cit.*, pp. 164ff.
[3] For a contrary view see P. T. Srinivasa Aiyangar's *The Stone Age in India*, p. 49, 'Madras University,' 1926.

mātās figures the cow, the *Surabhi* or the *Kāmadhenu*, and the worship of the cow can be traced to the period so early as the Chalcolithic age, if not earlier. The idea of the Mother Goddess, as has been ably pointed out by the archæologist, gained acceptance throughout the ancient civilised world, and must therefore be traced to a common origin and common culture which once swayed the minds and activities of the ancient peoples.[1] A practical instance of this aspect is the Bos Indicus (*Brāhmaṇi* or humped bull) which is the peculiar variety of India, which appears in the early sculptures of Susa, Mesopotamia, Africa, and other places. To the Hindu mind the cult of the bull could not be sufficiently separated from the cult of the cow.

The next topic for consideration is whether iconic images were objects of worship. The phallic emblems and baetylic stones which were largely discovered in the Indus region are the evidence of their worship. It is natural to suppose that these were housed in special temples built for the purpose. From the excavations made the archæologists have not decided conclusively whether the remains represent temples or building sites of houses and palaces.[2] The elaborate forms of worship as warranted by the finds presuppose the existence of a shrine. This is further corroborated by the pillared halls, the votive offerings,[3] the symbol of *svastika* the design of which is found on seals,[4] the figures and figurines on the engravings with the standards, last but not the least, the two vessels identified with a lamp and an incense burner.[5]

While still at this topic let me refer to some other cults which were in evidence at Mohenjodaro. These are the worship of trees, of animals, and of water. Says Sir John Marshall: 'That the animistic conceptions which have distinguished the worship of trees throughout the historic period were common also to the Chalcolithic age is clear from several seals and sealings.'[6] There was of course the tree of universal worship, the pipal tree (*ficus religiosa*), which the

[1] For the worship of Mother Goddess in her diverse manifestations in North India of modern times see Crooke: *Natives of Northern India* (1907), pp. 234 ff.
[2] *Op. cit.* Vol. I, p. 22.
[3] *Op. cit.*, Vol. II, p. 397.
[4] *Ibid.*, p. 374.
[5] *Op. cit.*, Vol. I, p. 69.
[6] *Ibid.*, p. 63.

Veda describes as embodying the fire god Agni and which the philosophic *Bhagavad Gītā* describes as the 'tree of wisdom and life'.

Ūrdhvamūlamadhaśśākam aśvattham prāhuravyayam/
Chandāṁsi yasya parṇāṇi yastamvedasa vedavit//

This conception, it may be remarked in passing, can be taken back to early Mesopotamia and Babylonia.[1] But the divine tree was *Kalpavṛkṣa,* the tree of Heaven whose representatives in the Earth are the cocoanut trees among others. It is a practice even today to see these trees first on rising in the morning and the cow with calf representing *Kāmadhenu.* Another remnant of this cult is the marriage of trees, generally a branch of the mango entwined with that of margosa. This is widely practised especially in South India by persons who are desirous of sons by legitimate wedlock. It may be, as Crooke surmises,[2] the intention is to bring the bride and bridegroom into close association with the productive powers of nature. The archæological evidence points to the personification of tree spirits, and trees as objects of worship. It is surmised again that the trees planted in the enclosure of the different buildings were provided with guards, a practice well-known to ancient Egypt.[3] We are here reminded of the *Kāvalmaram* (guardian-trees) referred to in the Sangam literature of the Tamils. Every chieftain of the ancient Tamil land had his favourite guardian tree which was the symbol of his sovereignty. To fell that tree amounted to subduing its possessor.[4] Again among the curiosities of ancient Tamil warfare, a number of plants and their flowers distinguished the eight kinds of operations. These are the *veṭci* (Ixora coccinia), *Karandai* (Verxonia arborea), *Vañji Kāñji* (Ulmus integrifolia), *Nocci* (Viten nirgundi), *Uḻiñai* (Ocrua lantar), *Tumbai* (Phlornis indica), and *Vāhai* (Mimosa flectuosa).[5] These are mentioned to show how the trees and plants were used in ancient times to sacred, social and warfare purposes. And is it not natural then that these trees became cult objects?

[1] *Op. cit.*, Vol. I, p. 64.
[2] *Religion and Folklore of Northern India*, pp. 416–17.
[3] *Op. cit.*, Vol. I, p. 165.
[4] See Author's *Studies in Tamil Literature and History*, p. 245.
[5] *Ibid.*, pp. 240–42.

Next with regard to animal worship. On p. 399 of Vol. II of *Mohenjodaro and Indus Civilisation* is furnished a list of the animals found on the tablets conclusively deciphered.

Examples	
Elephant	6
Antelope	5
Hare	5
Rhinoceros	4
Buffalo (?)	4
Short-horned bull	4
Human figure	3
Goat	2
Brāhmani Bull	2
Tiger	2
Two-headed animal	2
Composite animal	1
Monkey (?)	1

Of this list the composite animal 'has the hind quarters of a rhinoceros and the forequarters of a leopard or tiger.' Otherwise the list favourably compares itself to the animal symbolism attributed to Aśoka and the Buddhist conception. It may be asked that the lion is conspicuous by its absence. But there is a representation of lions on the small sealing figured in Pt. XII, 12, where two lions appear as 'Genii'.[1] Though the figures are illegible, there is no doubt that they are lions, especially, in view of the fact that the cult of the Mother Goddess whose riding animal is lion, is widely prevalent. It may be noticed in passing that to build a theory of Aśoka's religion on animal symbolism cannot stand.[2]

To turn from this parenthetical remark, one of the human figures (Pl. CXVII, 16) dressed in a costume of leaves looks very much like a hunter with his bow and arrow, just close to his quarry.[3] But the interesting point here is that this hunter has horns on his head, which have been identified with the trident of Śiva. I therefore propose to identify this divine hunter with Lord Śiva. Is this not appropriate to the legend of the later tradition in the *Mahābhārata* and Bhāravi's

[1] See *op. cit.*, Vol. I, p. 2, note 1, pp. 52 and 70.
[2] See *J.O.R.*, 1930, pp. 267ff.
[3] *Op. cit.*, Vol. II, p. 399.

Kirātārjunīya where Śiva in the form of a Kirāta[1] aids Arjuna in slaying the demon Mūka in boar-form and afterwards wrestles with Arjuna himself to test his prowess and finally awards him magic weapons which Arjuna desired to have by performing austere penance? Added to this is the fact, represented by a seal, of a therianthropic deity pursuing a tiger.[2] This perhaps illustrates the legend of Śiva killing the monster in the shape of a tiger and again of an elephant. Hence Śiva came to be clad in the skin of the tiger and the elephant. The legends connected with Śiva as the Divine Hunter are, it is reasonable to assume, known to the Indus people, and therefore we have to conclude that the origin of Śaivism is clouded in deep mystery and is to be traced far back into the hoary past. These suggest the antiquity of tradition and folklore in India which were reduced to writing millenniums after, in the Purāṇa literature.

From an examination of the elaborate bathing arrangements in Mohenjodaro both in public places and in private houses the archæologists think that worship of water might have been considered as sanctimonious.[3] The Veda proclaims *Āpo vai devāh,* meaning that waters were regarded as celestials. If Sir John Marshall thinks that in Mohenjodaro there was the deification of waters, it was again a Vedic conception. There is at least no warrant to show that reverence was paid to waters and that the river or pool was regarded a personal deity, by the pre-Aryan people.

After examining the striking resemblances between certain figures in the Indus valley and those of Sumer and Western Asia, Sir John Marshall observes: 'Either the Indus Valley type must have been borrowed from the Mesopotamian or the Mesopotamian from the Indian, and seeing how intimately the Gilgamish-Eabani legend is bound with Sumer, it is reasonable to conclude that the borrowing was done by India.'[4] On the very evidence adduced we agree with the distinguished archæologists, H. R. Hall and L. A. Waddell, that it

[1] The *Kirātas* are one among the anuloma castes of Manu (X, 44). They are apparently people of ancient Crete, whose civilisation is so similar to that of the early Hindu civilisation. Dr. S. K. Chatterjee (*Modern Review*, December, 1924), would trace even words Dravidian and Tamil to the Cretan. It may be that these Cretans claimed the hunter Śiva as their deity.

[2] *Op. cit.*, Vol. I. p. 67.

[3] *Op. cit.*, Vol. I, pp. 75–76.

[4] *Op. cit.*, Vol. I, p. 76.

was the other way round, viz., Sumer, Mesopotamia, and even Egypt borrowed from the Indus region. Reverence to Siva, Sakti, and the practice of *Yoga* are all distinctly and prominently Indian in character. Most of them were adapted by the legends of Elam, Sumer and other ancient countries. To cite an instance, female statuettes like the figurines representing the Mother Goddess have been discovered in several places in Western Asia extending as far as the Nile. Some other resemblances are the sacred Tree of Life in Babylonia and the Sumerian God Enkidu.

Now remains a study of the funerary religion of the Indus people. Of this we know but little.[1] The evidence available at Mohenjodaro is meagre and that at Harappa is fairly abundant. But the latter is definitely later. The available evidence is discussed under the three heads : Complete burials, Fractional burials, and post-Cremation Burials. Twenty-one skeletons of the first category are found at Mohenjodaro and are said to point to the declining stage of Mohenjodaro culture. But at Harappa there are examples of orthodox burial. Of the type of fractional burials in which the body had been exposed to the beasts and birds there is evidence in Mohenjodaro and Harappa. At both these places a class of large wide-mouthed urns has been brought to light, along with a number of vessels and objects intended for the use of the departed in their after-life. It is concluded that cremation was probably the usual method in the disposal of the dead in the Indus period. It may be noted that there is a resemblance between these and those in Baluchistan as revealed by the discoveries at Näl and Shahitump.

SOME FEATURES OF THE CULTURE

By far the most interesting study is the study of the general level of the culture of the Indus people. One cannot deal it in any way elaborately in a paper like this. Let me therefore rest content by only mentioning the chief features of that culture which is indelibly marked in the finds and ruins excavated. Here one sees the glorious contribution made by the results of archæological excavations in the reconstruction of the story of human development. For the authority of the classical historians and even inscriptions is still a thing of

[1] This para follows Chapter VI, *Disposal of the Dead*, op. cit., Vol. I.

the future. Before the excavations were made, it was thought that the Vedic period was the earliest period of civilised culture, and this period could go beyond the 2nd millennium at the most. But now the wonderful culture where Ancient India has revealed her past glory has made the scholars pause and think whether the Vedic period would have to be pushed back by a few millenniums or whether this Indus culture is pre-Vedic. The conclusions of those who uphold the latter theory cannot be made however to square with the facts. Some of these have been put to scrutiny in the foregoing pages. What the others are let me mention in passing.

The archæologists brought to light the fact that there were massive buildings terraced and with stairways leading to upper storeys.[1] There was a system, a plan and a method in the laying of these buildings.[2] The material was largely of burnt brick. Wells, bathrooms, and scientific drainage are in evidence. That the Municipal authorities looked to the health of the city is seen from the systems of drainage, the Great Bath in public streets, the dustbins both public and private. Trees and plants were allowed to grow in the enclosures.

There was an extensive intercourse between this region and Elam, Mesopotamia and Africa. Agriculture was the chief industry; it was the mainstay of the people. A large number of saddle-querns bear the test and they are made of basalt. Wheat was the principal article of foodstuff. There were flint implements with long flakes and cores. Though most of them were used for warfare, some were put to agricultural purposes. Stone drill resembling that in Egypt, mace-heads of different stones and types were used as weapons. The lentoid type of this discussed in the late levels of Mohenjodaro has been found in Elam and Egypt. There are again a large number of weights of which as many as seven types are distinguished. Some of these coincide with those used in Egypt and Mesopotamia. A. S. Hemmy compares these weights with the Babylonian and other systems and concludes that the Indian system was based on the rice grain.[3]

[1] According to the latest *Annual Report* (1928-29) a double staircase was found in a large and important building. (See p. 71).

[2] Perhaps there were no windows. Simple ventilation holes just beneath the ceilings of the rooms answering to the description in the Tamil classics served their purpose. (*Ibid.*, p. 69).

[3] *Op. cit.*, Vol. II, pp. 594ff.

These demonstrate the fact that it was a period of flourishing trade and commerce.

Among the weapons of offence and defence are seen blade axes, spear and lance heads, arrow heads, knives and daggers, and the bow.

The personal ornaments consisted of finger rings, ear-rings, bracelets, necklaces, and nose studs, hair pins, beads and others which serve as connecting link between Sumer and Indus Valley.[1] Among the precious stones figure chiefly lapis-lazuli, agate, chalcedony, jasper, Amazone stone, heliotrope, plaspina, which are used in beads and other ornaments. Some of the ornaments were of copper and bronze. Shell bracelets were common. The large use of gold and silver for jewellery and vessels is also in evidence.[2] Combs, buttons and pendants were in use.

Closely connected with these is the potter's art, the antiquity of which is in evidence in Sind. It is difficult to accept the theory of Dr. Hall that Elam was the first home of the cart wheel and the Potter's hand wheel. For no chariot has been so far discovered there. The complicated chariot wheel must be attributed to the genius of the early potter.[3] Coming to the actual ware excavated, we have both the plain ware and the painted ware, the material used was sand or lime mixed with clay. Vases with flat bases, jars with slips with a thick colour coating on the outside, pans with incised work, offering stands or censers, jars with pedestal bases, narrow-based bowl, goblets, basins, dishes and cups are some of the numerous and miscellaneous types.[4] The painting was either black or red. Other colours like the green were also used. So also the use of brush. Animal designs of pottery, plant designs, hide motif, sun motif, different types of borders, and other patterns are also of much interest to the antiquarian and most of them bear marked resemblance to Baluchistan and Elam pottery works. In Mesopotamia it is said that the painted pottery died out at the commencement of the Sargonic period. The Sumerians used it in the early age of their history while there is a continuity of that art to

[1] *Ibid.*, pp. 505ff.
[2] See *op. cit.*, Ch. XXVI.
[3] *Op. cit.*, Vol. I, p. 288.
[4] See whole of Chap. XVII, *op. cit.*, Vol. I.

the present day in India. This shows that the Sumerians took with them the Indian potter's art from Sind and gave it up because the locale of the country in which they settled did not perhaps suit the continuity of that art.[1]

There are a number of other aspects of this early culture equally interesting and affording rich and reliable material for the antiquarian. Let me confine only to one more aspect of this, viz., the script on the seals which again bear a close resemblance to those of Elam and Sumer. The seals contain impressions. Five are found on jars and thirty on tablets.[2] The same seals and sealings were found in Mesopotamia. The signs in early scripts are invariably pictographs and the signs of Mohenjodaro are no exception to this rule. 'The *impression* produced by the seal, not the seal itself, gives the true order of the inscription.' From a published impression by Father Scheil in *Revue d'Assyiyiologic,* XXII, it has been shown that 'these marks were affixed to clay labels upon bales of goods, in precisely the same way as the Babylonian seals were rolled over the clay "dockets" or the Egyptian seals impressed upon the clay stoppers of wine jars'. That such a script for a similar purpose was in use in Tamil India is borne out by the *Silappadikāram,* a *Sangam* classic. The term *Kaṇṇeḻuttu* which occurs twice in this book[3] refers to pictograph writing of labels affixed to bales of goods. This shows that a similar practice, a remnant of the old script was known in the early centuries of the Christian era. Apparently it was due to the large volume of trade between South India and the Middle East and Africa centuries before the Christian era. It also suggests active intercourse with the Indus Valley. Be this as it may, one finds an analogy between this script and the Minoan. As regards the nature of the script, it is not an alphabet. But what it is exactly and what are the contents of the inscription, we cannot positively say anything in the present state of our knowledge. Probably the inscriptions denote names and titles. From the seals discovered at Susa and Kish and at Ur, it is inferred that the script was used in the third millennium B.C. The interesting chapter (XXII)

[1] Vol. I, pp. 318ff.
[2] See *op. cit.*, p. 393ff.
[3] V, 112 and XXVI, 136—See also M. Rāghava Aiyangar's '*Ceran Senguttuvan*', p 129f.

which furnishes the above information is concluded thus: 'An open mind may equally find very close and remarkable similarities between some of these signs and the marks (*Wasm*) of Arab and African tribes: Such signs have also been found at Selima in the Libyan desert. Some will certainly hold that the resemblances are accidental. They may equally be due to a traditional use of certain trading marks which has lasted until comparatively recent period.'

Prof. S. Langdon of Oxford has a noteworthy contribution on this subject.[1] He is of opinion—and perhaps he is correct—that the Indus script furnishes the original of Brāhmi script, the early Indian alphabets and the character of inscriptions of Aśoka. According to him the Indus signs 'resemble the Egyptian hieroglyphs far more than they do the Sumerian linear and cuneiform system.' In a postscript to this chapter he furnishes similar or identical signs between this script and the Sumerian. He concludes his brilliant essay thus: 'In any way we may look at the problem, the Aryans in India are far more ancient than history admits. Their migration across Anatolia, where traces of them are found in the inscriptions of the Hittite capital, as early as the seventeenth century, is an hypothesis entirely contradictory to the new situation revealed by these discoveries in the Indus Valley. Far more likely is it that the Aryans in India are the oldest representatives of the Indo-Germanic race.'[2] In this connection K. P. Jayaswal draws our attention to an important record, the Vikram-Khole inscription as a link between Mohenjodaro and Brāhmi scripts. He is of opinion that from Brāhmi the Phœnicians and European scripts are derived.[3]

DATE OF THE CULTURE

Though a large number of evidence point to the antiquity, much earlier than the archæologists who have examined the finds closely, would assign, we propose to deal with only two pieces of evidence and leave the reader to judge for himself. One is the large number of the finds of the Indus seals in Mesopotamia and Elam. This incontestable epigraphical

[1] *Op. cit.*, see Ch. XXIII, which I have followed.
[2] *Op. cit.*, Vol. II, p. 432.
[3] See *J.B.O.R.S.*, 1920, and the *Indian Ant.* (1933), pp. 58 f. *Cf.* Pran Nath, The Script of the Indus Valley Seals—*I.H.Q.* (1932) Supplement.

material is found even in the lower strata and of it as many as seven have been clearly deciphered. Though it would be difficult to assign these seals to any definite chronological limit by a study of them alone, yet the ancient history of Mesopotamia and Elam comes to our aid. The Indus seals brought to light in these countries are decisively pre-Sargonic.[1] Dr. Hall,[2] following Mr. L. W. King, assigns 2700 B.C. on archæological grounds for Sargon and Narām-sin. (These seem to be rather Indian names and sound like Sāgaram and Narasimhan.) Again the three Indus seals discovered at Lagash and Umma point to a similar antiquity. For Lagash and Umma disappear from history before 2000 B.C. at the latest. A comparative study of these seals found at Mesopotamia and Elam decisively proves that they were known to a period earlier than 2700 B.C. The other inference is, as Prof. Langdon observes, that the civilisation of the Indus Valley is as old as that of Sumer and Egypt.[3] In other words, the Indus civilisation is contemporaneous with, if not earlier than, the Age of the Pyramid-builders of Egypt, the beginnings of which may be attributed to C. 3200 B.C.[4]

The excavations of the buildings and building sites 'have disclosed not less than seven strata of remains.' Of these seven 'the three latest are distinguished from their predecessors by increasing signs of decadence in the size and construction of the buildings, and that, in some areas, though not in all, there is also a well defined break between the remains of the third and fourth strata from the top, as if the city had been reduced to ruin at that time and remained in that condition for an appreciable period before being re-built.'[5] Though there is evidence of more strata than the seventh, yet it is not possible to excavate such lower levels owing to the difficulty of the rise of subsoil water.

Sir John Marshall enters into a critical examination of these seven layers of buildings in an informing chapter (VIII).

[1] *Cf.* in this connection plate XXVIII (*a*) in the *Annual Report* 1928-29 *of the Archæological Survey of India*,—an impression of a cylinder seal being the representation of the crocodile with the fish in its mouth, discovered in the upper strata of Mohenjodaro and resembling in form pre-Sargonic seal of Mesopotamia. (Pp. 73–74.)

[2] See *Ancient History of the Near East*, pp. 28–29.

[3] *Op. cit.*, Vol. II, p. 426.

[4] See Hall, *op. cit.*, p. 121.

[5] *Op. cit.*, Vol. I, pp. 9 & 10.

These seven are distributed as three of the Late period, three of the Intermediate and one of the Early. If the analogy of sites excavated elsewhere, such as Troy, Athens and Rome can be applied to the Indus Valley sites, then we have to allow at least a period of thousand years between the one layer and the other. This means that Mohenjodaro civilisation must take us to a date earlier than 5000 B.C. But Sir John Marshall contends that while normal conditions prevailed in other lands, it was not so in the Indus Valley. First, the city was in perpetual danger of inundation. Secondly was the uniform character of the antiquities. In these circumstances the archæologist allows the minimum space of 500 years and adds, that in view of the full-fledged character of the culture even at the outset, 'we are bound therefore to postulate for it a long period of antecedent evolution'.[1] But what could be this long period of antecedent evolution we could not even conjecture at the present state of our knowledge. In the light of the above reasoning Sir John suggests that 'the occupation of Mohenjo Daro fell approximately between 3250 and 2750 B.C. But this date is by no means decisive or conclusive. For, it is calculated only at half of what in normal conditions would have been assigned. Though climatic conditions may vary, yet the computation worked at is a very moderate approximation, and one would like to fix it as 750 years if there is any compromise in historical investigations.

We shall conclude this essay by quoting once again the veteran archæologist: 'One thing that stands out clear and unmistakable both at Mohenjodaro and Harappa, is that the civilisation hitherto revealed at these two places is not an incipient civilisation, but one already age old and stereotyped on Indian soil, with many millennia of human endeavour behind it. Thus India must henceforth be recognised, along with Persia, Mesopotamia, and Egypt as one of the most important areas where the civilising processes of society were imitated and developed.'[3]

[1] *Op. cit.*, pp. 102–3.
[2] *Op. cit.*, p. 104.
[3] Preface, p. viii.

A STATISTICAL STUDY OF THE PRICES OF FOODGRAINS IN THE MADRAS PRESIDENCY FROM 1874 TO 1930

Part I

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Continued from page 238, Vol. V, No. 2, July 1933.)

Index numbers of prices of foodgrains on the EAST COAST (Central)
BASE: *Average price for the* 10 *years* 1874-75 *upto* 1883-84 = 100

Year.	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1874-75	2·44	77·8	1·63	77·2	1·50	78·2	1·40	73·3
1875-76	2·66	84·8	1·74	82·4	1·73	90·2	1·61	84·3
1876-77	4·21	134·2	3·34	158·1	2·97	154·8	3·04	159·2
1877-78	4·97	158·4	4·30	203·6	3·64	189·7	3·90	204·2
1878-79	3·86	123·0	2·61	123·6	2·33	121·4	2·33	122·0
1879-80	3·01	95·9	2·07	98·0	1·84	95·9	1·77	92·7
1880-81	2·55	81·3	1·56	73·9	1·50	78·2	1·40	73·3
1881-82	2·40	76·5	1·31	62·0	1·12	58·4	1·24	64·9
1882-83	2·93	93·4	1·30	61·6	1·25	59·9	1·21	63·4
1883-84	2·35	74·9	1·26	59·7	1·31	68·3	1·20	62·8
1884-85	2·75	87·6	1·66	78·6	1·67	87·0	1·44	75·4
1885-86	2·76	88·0	1·76	83·3	1·67	87·0	1·46	76·4
1886-87	2·44	77·8	1·47	69·6	1·48	77·1	1·34	70·2
1887-88	2·42	77·1	1·46	69·6	1·47	76·6	1·28	67·0
1888-89	2·59	82·5	1·63	77·2	1·62	84·4	1·35	70·7

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1889-90	3·00	95·6	1·60	75·8	1·72	89·6	1·42	74·3
1890-91	3·38	107·7	1·91	90·4	1·91	99·5	1·66	86·9
1891-92	3·91	124·6	2·70	127·8	2·74	142·8	2·47	129·3
1892-93	3·85	122·7	2·32	109·8	2·33	121·4	2·14	112·0
1893-94	3·39	108·0	2·17	102·7	2·30	119·9	1·97	103·1
1894-95	3·16	100·7	1·90	90·0	1·82	94·8	1·64	85·9
1895-96	3·06	97·5	1·75	82·9	1·65	86·0	1·52	79·6
1896-97	3·36	107·1	2·18	103·2	1·97	102·7	1·92	100·5
1897-98	3·95	125·9	2·81	133·0	2·31	120·4	2·43	127·2
1898-99	3·33	106·1	2·26	107·0	2·06	107·3	2·06	107·9
1899-1900	3·40	108·3	2·32	109·8	2·27	118·3	2·24	117·3
1900-01	4·18	133·2	2·90	137·3	2·79	145·4	2·86	149·7
1901-02	3·52	112·2	2·47	117·0	2·21	115·2	2·29	119·9
1902-03	3·04	96·9	1·76	83·3	1·61	83·9	1·64	85·9
1903-04	2·83	90·2	1·56	73·9	1·47	76·6	1·43	74·9
1904-05	3·37	107·4	2·05	97·1	2·06	107·3	1·95	102·1
1905-06	4·15	132·2	2·78	131·6	2·76	143·8	2·67	139·8
1906-07	4·49	143·1	1·98	93·8	2·98	155·3	2·96	155·0
1907-08	4·84	154·2	3·08	145·8	3·24	168·8	3·03	158·6
1908-09	5·29	168·6	3·45	163·4	3·58	186·6	3·31	173·3
1909-10	4·54	144·7	3·23	152·9	3·14	163·6	3·04	159·2
1910-11	4·22	134·5	2·91	137·8	2·62	136·5	2·76	144·5
1911-12	4·65	148·2	3·17	150·1	3·01	156·9	2·84	148·7
1912-13	5·56	177·2	3·73	176·6	3·61	188·1	3·20	167·5
1913-14	5·42	172·7	3·43	162·4	3·56	185·5	3·23	169·1
1914-15	4·99	159·0	3·39	160·5	3·10	161·5	2·91	152·4
1915-16	4·84	154·2	3·13	148·2	2·87	149·6	2·70	141·4
1916-17	5·05	160·9	3·21	152·0	3·09	161·0	2·85	149·2
1917-18	4·83	153·9	3·49	165·2	3·10	161·5	2·86	149·7
1918-19	7·29	232·3	5·61	265·6	5·23	272·5	4·50	235·6
1919-20	8·91	283·9	6·70	317·2	6·55	341·3	6·29	329·3
1920-21	7·40	235·8	5·04	238·6	5·27	274.6	5·13	268·6
1921-22	7·31	232·9	5·15	243·8	5·20	271·0	4·83	252·9
1922-23	7·18	228·9	4·70	222·5	5·00	260·6	4·60	240·8
1923-24	6·91	220·2	5·26	249·1	5·16	268·9	4·65	243·5
1924-25	8·08	257·5	6·14	290·7	5·34	278·3	5·06	264·9
1925-26	7·37	234·9	5·39	255·2	4·86	253·3	4·59	240·3
1926-27	7·44	237·1	5·26	249·1	4·87	253·8	4·52	236·6
1927-28	7·63	243·1	5·20	246·2	4·86	253·3	4·63	242·4
1928-29	6·92	220·5	5·01	237·2	4·74	240·0	4·61	241·4
1929-30	6·11	194·7	4·43	209·8	4·17	217·3	3·85	201·6

Index numbers of prices of foodgrains in DECCAN.
BASE: *Average price for the* 10 *years* 1874-75 *upto* 1883-84.

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1874-75	2·30	70·2	1·30	65·4	1.43	68·1	1.26	70·2
1875-76	2·50	76·3	1·52	76·5	1·59	75·7	1·47	81·8
1876-77	4·68	142·9	3·56	179·1	3·66	174·3	2·66	148·1
1877-78	5·45	166·4	4·04	203·2	4·15	197·6	3·90	217·1
1878-79	3·90	119·1	2·87	144·4	2·72	129·3	2·52	140·3
1879-80	2·84	86·7	1·83	92·1	2·02	96·2	1·69	94·1
1880-81	2·78	84·9	1·20	60·4	1·41	67·1	1·15	64·0
1881-82	2·82	86·1	1·21	60·9	1·39	66·2	1·12	62·4
1882-83	2·81	85·8	1·18	59·4	1·34	63·8	1·09	60·7
1883-84	2·67	81·5	1·17	58·9	1·29	61·4	1·10	61·2
1884-85	2·93	89·5	1·61	81·0	1·71	81·4	1·44	80·2
1885-86	2·98	91·0	1·53	77·0	1·59	75·7	1·37	76·3
1886-87	2·79	85·2	1·37	68·9	1·46	69·5	1·24	69·0
1887-88	2·59	79·1	1·21	60·9	1·47	70·0	1·09	60·7
1888-89	2·85	87·0	1·38	69·4	1·64	78·1	1·21	67·4
1889-90	2·99	91·3	1·35	67·9	1·60	76·2	1·20	66·8
1890-91	3·20	97·7	1·45	72·9	1·96	93·3	1·33	74·1
1891-92	4·19	127·9	2·29	115·2	2·50	115·2	2·12	119·0
1892-93	3·58	109·3	2·02	101·6	2·14	101·9	1·86	103·6
1893-94	3·27	99·8	1·81	91·0	1·99	94·8	1·64	91·3
1894-95	3·26	99·5	1·52	76·5	1·75	83·3	1·42	79·1
1895-96	3·25	99·2	1·37	68·9	1·63	77·6	1·23	68·5
1896-97	4·07	124·3	2·30	115·7	2·31	110·0	1·93	107·5
1897-98	4·54	138·6	2·61	131·3	2·77	131·9	2·37	132·0
1898-99	3·35	102·3	1·64	82·5	1·90	90·5	1·63	90·8
1899-1900	3·94	120·3	2·50	125·8	2·83	134·8	2·30	128·1
1900-01	4·42	135·0	2·94	147·9	2·92	139·0	2·79	155·3
1901-02	4·24	129·5	2·55	128·3	2·50	119·0	2·36	131·4
1902-03	3·54	108·1	1·74	87·5	1·75	83·3	1·58	88·0
1903-04	3·00	91·6	1·26	63·4	1·30	61·9	1·18	65·7
1904-05	3·30	100·8	1·75	88·0	1·86	88·6	1·65	91·9
1905-06	4·15	126·7	2·18	109·7	2·37	112·9	2·13	118·6
1906-07	4·33	132·2	2·41	121·2	2·53	120·5	2·46	137·0
1907-08	4·90	149·6	2·85	143·4	2·99	142·4	2·75	153·1
1908-09	5·52	168·5	2·95	148·4	3·21	152·9	2·93	163·1
1909-10	4·74	144·7	2·63	132·3	2·82	134·3	2·65	147·5
1910-11	4·35	132·8	2·44	122·7	2·44	116·2	2·33	129·7
1911-12	4·79	146·3	2·69	135·3	2·72	129·5	2·48	138·1

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1912-13	5·66	172·8	2·97	149·4	3·18	151·4	2·74	152·6
1913-14	5·44	166·1	2·92	146·9	3·21	152·9	2·79	155·3
1914-15	5·18	158·2	2·57	129·3	2·87	136·7	2·57	143·1
1915-16	4·96	151·5	2·35	118·2	2·66	126·7	2·30	128·1
1916-17	5·06	154·5	2·64	132·8	2·93	139·5	2·60	144·8
1917-18	5·40	164·9	3·48	175·1	3·41	162·4	3·05	169·8
1918-19	7·77	237·3	5·63	283·2	5·47	260·5	4·74	263·9
1919-20	9·27	283·1	6·70	337·0	6·71	319·5	6·11	340·2
1920-21	8·31	253·7	5·77	290·2	5·82	277·1	5·19	289·0
1921-22	7·88	240·6	5·00	251·5	5·21	248·1	4·55	253·3
1922-23	7·32	223·5	3·99	200·7	4·44	211·4	3·88	216·0
1923-24	7·63	233·0	4·47	224·8	4·66	221·9	4·06	226·1
1924-25	8·05	245·8	3·53	228·4	4·37	208·1	4·20	233·9
1925-26	7·45	227·5	3·92	177·6	3·96	188·6	3·45	192·1
1926-27	7·66	233·9	4·54	197·2	4·23	201·4	3·71	206·6
1927-28	7·71	235·4	4·30	216·3	4·41	210·0	3·92	218·3
1928-29	7·12	217·4	3·82	192·2	4·06	193·3	3·72	207·1
1929-30	6·76	206·4	3·50	176·1	3·90	185·7	3·44	191·5

Index numbers of prices of foodgrains on the EAST COAST *(North).*

BASE: *Average price for the* 10 *years* 1874-75 *upto* 1883-84 = 100.

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1874-75	2·20	77·7	1·43	74·9	1·40	74·0	1·19	71·9
1875-76	2·13	75·2	1·33	69·6	1·41	74·5	1·18	71·3
1876-77	3·10	109·5	2·40	125·7	2·42	127·8	2·00	120·9
1877-78	4·90	173·0	3·70	193·7	3·73	197·0	3·28	198·3
1878-79	3·93	138·8	2·77	145·0	2·42	127·8	2·51	151·8

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1879-80	2·60	91·8	1·72	90·1	1·74	91·9	1·49	90·1
1880-81	2·22	78·4	1·42	74·3	1·43	75·5	1·18	71·3
1881-82	2·25	79·4	1·27	66·5	1·31	69·2	1·16	70·1
1882-83	2·41	85·1	1·41	73·8	1·48	78·2	1·24	75·0
1883-84	2·58	91·1	1·65	86·4	1·59	84·0	1·31	79·2
1884-85	2·68	94·6	1·65	86·4	1·61	85·1	1·34	81·0
1885-86	2·79	98·5	1·80	94·2	1·76	93·0	1·43	86·5
1886-87	2·60	91·8	1·63	85·3	1·62	85·6	1·33	80·4
1887-88	2·43	85·8	1·61	84·3	1·61	85·1	1·34	81·0
1888-89	2·84	100·3	1·74	91·1	1·85	97·7	1·64	99·2
1889-90	2·84	100·3	1·74	91·1	1·75	92·4	1·51	91·3
1890-91	2·86	101·0	1·83	95·8	1·83	96·7	1·46	88·3
1891-92	3·48	122·9	2·38	124·6	2·40	126·8	2·00	120·9
1892-93	3·32	117·2	2·23	116·8	2·11	111·5	1·84	111·2
1893-94	3·04	107·3	2·10	109·9	2·06	108·8	1·63	98·5
1894-95	2·81	99·2	1·77	92·7	1·73	91·4	1·51	91·3
1895-96	2·70	95·3	1·64	85·9	1·63	86·1	1·38	83·4
1896-97	3·57	126·1	2·26	118·3	2·29	121·0	2·08	125·8
1897-98	4·14	146·2	3·10	162·3	3·08	162·7	2·79	168·7
1898-99	3·06	108·1	1·90	99·5	1·97	104·1	1·80	108·8
1899-1900	3·39	119·7	2·38	124·6	2·54	134·2	2·04	123·3
1900-01	3·92	138·4	2·70	141·4	2·49	131·5	2·46	148·7
1901-02	3·52	124·3	1·93	101·0	1·98	104·6	2·04	123·3
1902-03	3·12	110·2	1·53	80·1	1·49	78·7	1·53	92·5
1903-04	2·78	98·2	1·44	75·4	1·31	69·2	1·31	79·2
1904-05	3·06	108·1	2·03	106·3	1·94	102·5	1·76	106·4
1905-06	3·85	135·9	2·47	129·3	2·45	129·4	2·35	142·1
1906-07	4·36	154·0	2·62	137·2	2·49	131·5	2·52	152·4
1907-08	4·82	170·2	3·02	158·1	2·97	156·9	3·03	183·2
1908-09	5·23	184·7	3·33	174·3	3·04	160·6	3·06	185·0
1909-10	4·31	152·2	2·92	152·9	2·69	142·1	2·55	154·2
1910-11	4·10	144·8	2·84	148·7	2·46	130·0	2·38	143·9
1911-12	4·69	165·6	2·99	156·5	2·87	151·6	2·64	159·6
1912-13	5·19	183·3	3·27	171·2	2·43	128·4	2·84	171·7
1913-14	4·86	171·6	2·90	151·8	2·73	144·2	2·68	162·0
1914-15	4·60	162·4	2·60	136·1	2·56	135·2	2·63	159·0
1915-16	4·75	167·7	2·75	144·0	2·64	139·5	2·71	163·8
1916-17	4·80	169·5	3·11	162·8	2·81	148·4	2·71	163·8
1917-18	4·73	167·0	3·48	182·2	3·11	164·3	2·74	165·7
1918-19	6·23	220·0	4·98	260·7	3·62	191·2	3·29	198·9
1919-20	8·13	287·1	6·58	344·5	5·91	312·2	5·83	352·5

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1920-21	8·00	282·5	5·53	289·5	5·69	300·6	5·18	313·2
1921-22	7·03	248·2	4·79	250·8	4·25	224·5	4·08	246·7
1922-23	6·20	218·9	3·90	204·2	3·69	194·9	3·43	207·4
1923-24	6·31	222·8	3·91	204·7	3·88	205·0	3·26	197·1
1924-25	7·03	248·2	4·44	232·5	4·08	215·5	3·64	220·1
1925-26	6·62	233·8	4·19	219·4	3·86	203·9	3·44	208·0
1926-27	6·73	237·6	4·49	235·1	4·48	236·7	3·95	238·8
1927-28	6·52	230·2	4·54	237·7	4·44	234·5	3·85	232·8
1928-29	5·91	208·7	3·92	205·2	3·81	201·3	3·41	206·2
1929-30	5·92	209·0	3·61	189·0	3·68	194·4	3·16	191·1

Index numbers of prices of foodgrains on the EAST COAST (South)
BASE: *Average price for the* 10 *years* 1874-75 *upto* 1883-84 = 100

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1874-75	3·02	93·8	1·63	99·8	1·64	89·6	1·52	87·4
1875-76	2·85	88·5	1·36	83·2	1·54	84·1	1·32	75·9
1876-77	4·15	128·9	2·24	137·1	2·57	140·4	2·46	141·5
1877-78	4·92	152·8	2·71	165·9	2·99	163·3	3·06	176·0
1878-79	4·38	136·1	2·45	149·9	2·65	144·7	2·57	147·8
1879-80	3·12	96·9	1·66	101·6	1·84	100·5	1·79	102·9
1880-81	2·70	83·9	1·22	74·7	1·42	77·6	1·34	77·1
1881-82	2·48	77·0	1·09	66·7	1·26	68·8	1·16	66·7
1882-83	2·25	69·9	0·98	60·0	1·17	63·9	1·08	62·1
1883-84	2·32	72·1	1·00	61·2	1·23	67·2	1·09	62·7
1884-85	3·19	99·1	1·57	96·1	1·83	99·9	1·64	94·3
1885-86	2·86	88·8	1·46	89·4	1·77	96·7	1·55	89·1
1886-87	2·61	81·1	1·24	75·9	1·51	82·5	1·38	79·4
1887-88	2·68	83·3	1·44	88·1	1·63	89·0	1·44	82·8
1888-89	2·82	87·6	1·45	88·7	1·67	91·2	1·47	84·5

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1889-90	3·26	101·3	1·66	101·6	1·89	103·2	1·65	94·9
1890-91	3·53	109·7	2·04	124·8	2·09	114·1	1·90	109·3
1891-92	3·67	114·0	2·31	141·4	2·40	131·1	2·26	130·0
1892-93	4·14	128·6	2·62	160·3	2·63	143·6	2·49	143·2
1893-94	3·49	108·4	2·30	140·8	2·35	128·3	2·08	119·6
1894-95	3·38	105·0	2·10	128·5	1·94	106·0	1·84	105·8
1895-96	3·10	96·3	1·93	118·1	1·71	93·4	1·59	91·4
1896-97	3·24	100·7	2·07	126·7	1·88	102·7	1·74	100·1
1897-98	4·05	125·8	2·75	168·3	2·52	137·6	2·36	135·7
1898-99	3·43	106·6	2·21	135·3	2·16	118·0	2·09	120·2
1899-1900	3·79	117·7	2·15	131·6	2·25	122·9	2·15	123·6
1900-01	3·10	96·3	2·63	161·0	2·67	145·8	2·51	144·3
1901-02	3·58	111·2	2·42	148·1	2·57	140·4	2·20	126·5
1902-03	3·04	94·4	1·77	108·3	1·95	106·5	1·67	96·0
1903-04	3·10	96·3	1·61	98·5	1·88	102·7	1·52	87·4
1904-05	3·52	109·4	2·04	124·8	2·30	125·6	1·94	111·6
1905-06	4·48	139·2	2·92	178·7	2·94	160·6	2·74	157·6
1906-07	4·69	145·7	3·00	183·6	3·15	172·0	2·88	165·6
1907-08	4·91	152·5	2·83	173·2	3·15	172·0	2·78	159·9
1908-09	5·32	165·3	2·99	183·0	3·26	178·0	2·97	170·8
1909-10	4·77	148·2	2·95	180·5	3·22	175·9	2·84	163·3
1910-11	4·37	135·8	2·91	178·1	3·18	173·7	2·70	155·3
1911-12	5·10	158·4	3·13	191·6	3·39	185·1	2·87	165·0
1912-13	5·81	180·5	3·40	208·1	3·57	195·0	3·13	180·0
1913-14	5·66	175·8	3·26	199·5	3·25	177·5	3·00	172·5
1914-15	5·23	162·5	3·18	194·6	3·23	176·4	2·84	163·3
1915-16	5·21	161·9	2·90	177·5	3·08	168·2	2·70	155·3
1916-17	5·41	168·1	3·09	189·1	3·27	178·6	2·90	166·8
1917-18	5·44	169·0	3·37	206·2	3·47	189·5	3·11	178·8
1918-19	7·94	246·7	4·80	293·8	5·19	283·5	4·58	263·4
1919-20	9·67	300·4	6·38	390·5	7·13	389·4	6·40	368·0
1920-21	7·70	239·2	4·58	280·3	5·72	312·3	4·85	278·9
1921-22	7·70	239·2	4·79	293·1	5·40	294·9	4·68	269·1
1922-23	7·63	237·0	4·61	282·1	5·42	296·0	4·80	276·0
1923-24	7·14	221·8	4·57	279·7	5·17	282·4	4·45	255·9
1924-25	8·69	270·0	4·95	302·9	6·24	340·8	5·14	295·6
1925-26	7·94	246·7	4·84	296·2	5·65	308·6	4·76	273·7
1926-27	7·62	236·7	4·65	284·6	5·54	302·6	4·59	263·9
1927-28	7·70	239·2	4·65	284·6	5·54	302·6	4·68	269·1
1928-29	7·31	227·1	4·46	272·9	4·89	267·1	4·40	253·0
1929-30	6·10	189·5	3·42	209·3	4·20	229·4	3·48	200·1

Index numbers of prices of foodgrains for the MADRAS PRESIDENCY.

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1874-75		82·7		79·3		77·5		76·3
1875-76		83·7		77·9		81·1		80·1
1876-77		127·2		150·0		149·3		140·5
1877-78		157·7		191·6		186·9		192·8
1878-79		127·7		140·7		130·9		136·9
1879-80		94·5		95·5		96·1		96·0
1880-81		82·9		70·8		74·6		73·5
1881-82		79·8		64·0		65·7		68·1
1882-83		83·3		63·7		66·5		67·7
1883-84		80·5		66·6		70·2		68·2
1884-85		92·1		85·5		88·4		82·5
1885-86		91·2		86·0		88·1		82·0
1886-87		83·5		74·9		78·7		74·4
1887-88		81·2		75·7		80·2		71·2
1888-89		88·9		81·6		87·9		78·3
1889-90		96·8		84·1		90·4		79·7
1890-91		103·1		96·0		100·9		87·2
1891-92		120·6		127·3		129·9		120·5
1892-93		117·6		122·1		119·6		113·0
1893-94		105·9		111·1		113·0		100·1
1894-95		101·0		96·9		93·9		86·5
1895-96		97·3		89·0		85·8		78·5
1896-97		113·3		116·0		109·1		103·0
1897-98		132·5		148·7		138·2		132·6
1898-99		106·2		106·1		105·0		103·5
1899-1900		116·0		123·0		127·6		119·9
1900-01		124·5		146·9		140·4		142·9
1901-02		117·0		123·6		119·8		118·9
1902-03		102·2		89·8		88·1		87·9
1903-04		95·6		77·8		77·6		76·0
1904-05		105·8		104·1		106·0		99·0
1905-06		130·7		137·3		136·7		134·4
1906-07		141·7		134·0		144·8		145·7
1907-08		153·4		155·1		160·0		152·6
1908-09		167·7		167·3		169·5		165·6
1909-10		145·2		154·7		154·0		148·9
1910-11		133·9		146·8		139·1		135·0
1911-12		151·5		158·4		155·8		145·5
1912-13		173·6		176·3		165·7		161·2
1913-14		167·3		165·1		165·0		156·8

Year	Rice 2nd sort		Cholam		Cumbu		Ragi	
	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.	Price in Rs. per maund	Index No.
1914-15		158·0		155·1		152·5		149·1
1915-16		156·7		147·0		146·0		141·3
1916-17		161·8		159·2		156·9		148·5
1917-18		163·9		182·2		169·4		159·7
1918-19		229·3		275·8		251·9		233·4
1919-20		279·7		347·3		340·6		323·4
1920-21		243·1		274·7		291·2		262·8
1921-22		234·2		259·8		259·6		246·3
1922-23		223·2		227·4		240·7		226·3
1923-24		220·7		239·6		244·6		225·6
1924-25		249·4		263·6		260·7		250·9
1925-26		232·3		237·1		238·6		226·8
1926-27		232·5		241·5		248·6		232·1
1927-28		230·5		246·2		250·1		234·8
1928-29		214·0		226·9		227·2		222·7
1929-30		195·7		196·1		206·7		194·2

Curves of Food Prices

A glance at these curves of food-prices will not fail to impress one with their striking similarity. This is true not for the natural divisions alone, but for the Presidency as well. The ups and downs in the curve for rice, for instance, are found to synchronise uniformly with the ups and downs in the curve for ragi. This is not a new phenomenon. Investigators in other provinces have noticed a similar tendency in the case of foodgrains. Professor Myles in his excellent survey, *Sixty Years of Punjab Food-Prices,* observes : "Speaking generally, wheat, barley, bajra, jowar and gram tend to move in price as though they were one commodity. Economists in India have long been familiar with the way in which the prices of food-stuffs rose and fell together, but it is doubtful whether the closeness of the relationship has been fully realised.' The prices of all the four foodgrains are affected to the same degree by physical as well as monetary causes.

Rainfall, artificial irrigation, etc., which account for the former affect the harvests of these grains equally, while the general causes which affect the price level are not confined to any one particular crop. It is not therefore surprising that the movements of their price-level should exhibit striking similarity.

Fluctuations of Food-Prices

A closer scrutiny of the above curves would reveal that while their ups and downs are almost synchronous, the prices of rice have on the whole been more stable than those of the other foodgrains. We cannot lay this down as a feature brought out by these curves by merely looking at them and satisfying ourselves that there have on the whole been more violent fluctuations in the indices for cholam, cumbu and ragi than in those for rice without verifying the correctness of our observation statistically. The standard deviation which is the 'yardstick' commonly employed in statistics to measure variation affords a good test of the degree of fluctuations. The following tabular statement gives the S. D's of the indices of the four foodgrains for the whole of the Madras Presidency for the period 1874-1929.

Foodgrain.	*S.D*
Rice	54·09
Cholam	59·99
Cumbu	65·56
Ragi	61·56

From the above it is clear that the variation in the price of rice has been least, and in the price of cumbu greatest. The coefficient of variation which is a still more refined measure of variation inasmuch as it allows for the differing magnitudes of the means of the characters under variation tells the same tale as the following table will show.

Foodgrain.	*Co-efficient of Variation*
Rice	37·9
Cholam	40·8
Cumbu	44·5
Ragi	43·9

An explanation of this greater stability of the prices of rice is necessary and may be hazarded. The trade in rice which

is the staple foodgrain in the Madras Presidency is naturally more mobile than the trade in any other foodgrain. A deficit in the supply of rice in any locality which may be brought about by famine or from other causes is soon made good by imports of rice into that locality from Burma or from divisions where there is a surplus. But in the case of the other food grains, their trade is mostly local and their prices respond to the effects of the seasons to a greater degree than in the case of rice. A comparison of the curves of the indices of prices of rice in the different natural divisions with those of the other food-grains will show that these curves exhibit greater stability of form from division to division than the curves for the other foodgrains. This is because the prices of rice unlike those of the other foodgrains have been determined not from local causes only, but from causes which have operated throughout the Presidency as a whole and to some degree in places outside as well.

Apart from the steadying influence on prices brought about by the greater mobility of the trade in rice we may also take note of another factor which would have contributed its share to the toning down of the fluctuations in the prices of rice as distinct from the other foodgrains. In this province, as in other provinces, 'so far as the consumption of foodgrains is concerned, the law of substitution is continually at work'. In times of high prices the poorer people who in times of low or moderately high prices alone can afford to buy rice are forced to buy cheaper foodgrains. Each of the other foodgrains finds its place as a substitute in the tracts in which it is largely grown, and the use of it as a substitute is dependent on individual tastes—prices apart. And this process of substitution is continually at work in response to changes in price. And what is the effect of this substitution? Obviously to contract the demand for rice in times of high prices, and to expand the demand for the coarser food-grains. The result is that the price of rice is lowered in times of high prices, and the prices of the cheaper foodgrains are raised. And when it is remembered that the trade in the coarser foodgrains is mostly local it is easy to see how this process of substitution can at times be very

effective in raising their prices. It is of course true that there is a certain class of population which at all times consumes rice, but the poorer classes can ill-afford to do it in times of high prices, and it would be interesting to estimate what percentage of the people resorts to the process of substitution in times of high prices.

That in periods of high prices the price of rice has on the whole tended to increase less than the prices of the other foodgrains is clearly brought out by an analysis of the figures of prices. A reference to the curves of indices of prices would show that four periods of rising prices stand out more prominently than the rest and they are 1875-1877, 1887-1891, 1903-1908, and 1915-1919. The indices of prices in the several years and their percentage increase in the various periods are given by the following statement.

1st Period: 1875-1877

Foodgrain	*Index in* 1875	*Index in* 1877	*Percentage Increase*
Rice	83·7	157·7	88·4
Cholam	77·9	191·6	146·0
Cumbu	81·1	186·9	130·5
Ragi	80·1	192·8	140·7

2nd Period: 1887-1891

Foodgrain	*Index in* 1887	*Index in* 1891	*Percentage Increase*
Rice	81·2	120·6	48·5
Cholam	75·7	127·3	68·2
Cumbu	80·2	129·9	62·0
Ragi	71·2	120·5	69·2

3rd Period: 1903-1908

Foodgrain	*Index in* 1903	*Index in* 1908	*Percentage Increase*
Rice	95·6	167·7	75·4
Cholam	77·8	167·3	115·0
Cumbu	77·6	169·5	118·4
Ragi	76·0	165·6	117·9

4th Period: 1915-1919

Foodgrain	*Index in* 1915	*Index in* 1919	*Percentage Increase*
Rice	156·7	279·7	78·5
Cholam	147·0	347·3	136·3
Cumbu	146·0	340·6	133·3
Ragi	141·3	323·4	128·9

From the above statement it is clear that the increase in the price of rice has been least in all the four periods of rising prices. The increase in the prices of the other foodgrains do not vary much from each other. This we may attribute to the fact that with poor people in times of high prices it is not a question of which foodgrain they should substitute for rice; they will be content with any so long as they can obtain it cheaply and in the mass in view of the very small differences in the prices of cholam, cumbu and ragi, the quantities of those foodgrains substituted for rice may not differ markedly from one another.

Now, what is the position in times of falling prices? Is there a tendency for poorer people to show a greater predilection for rice than for the other foodgrains and is it therefore true to surmise that the price of rice will fall less than the prices of the other foodgrains? What do the figures reveal? As before, four periods, but, in this case of falling prices are taken, i.e. (1) 1877-81, (2) 1891-95, (3) 1900-03, and (4) 1919-22. The prices of all the four foodgrains seem to have fallen abnormally in these four periods, and the following tables will compare their falls in the different periods.

1st Period: 1877-1881

Foodgrain	*Index in* 1877	*Index in* 1881	*Percentage Fall*
Rice	157·7	79·8	49·4
Cholam	191·6	64·0	66·6
Cumbu	186·9	65·7	64·8
Ragi	192·8	68·1	64·7

2nd Period 1891-1895

Foodgrain	*Index in* 1891	*Index in* 1895	*Percentage Fall*
Rice	120·6	97·3	19·3
Cholam	127·3	89·0	30·1
Cumbu	129·9	85·8	36·6
Ragi	120·5	78·5	34·9

3rd Period: 1900-1903

Foodgrain	*Index in* 1900	*Index in* 1903	*Percentage Fall*
Rice	124·5	95·6	23·2
Cholam	146·9	77·8	47·0
Cumbu	140·4	77·6	44·7
Ragi	142·9	76·0	46·8

4th Period: 1919-1922

Foodgrain	*Index in* 1919	*Index in* 1922	*Percentage Fall*
Rice	279·7	223·2	20·2
Cholam	347·3	227·4	34·5
Cumbu	323·4	240·7	29·3
Ragi	340·6	226·3	30·0

The above figures in addition to proving that the fall in the price of rice in periods of falling prices has been consistently less than the fall in the prices of the other foodgrains reveal also the remarkable fact that the fall in the prices of the other foodgrains has been more or less the same. In periods of rising prices also we noticed that there was a tendency for the prices of these foodgrains to rise by more or less the same amount. This shows that this process of substitution of the coarser foodgrains for rice in times of rising prices or of rice for the coarser food-grains in times of falling prices has not only tended to tone down the fluctuations in the price of rice but has also resulted in maintaining the equilibrium in the ratios of the quantities of the other foodgrains consumed.

LOGARITHMIC CURVES OF FOOD PRICES

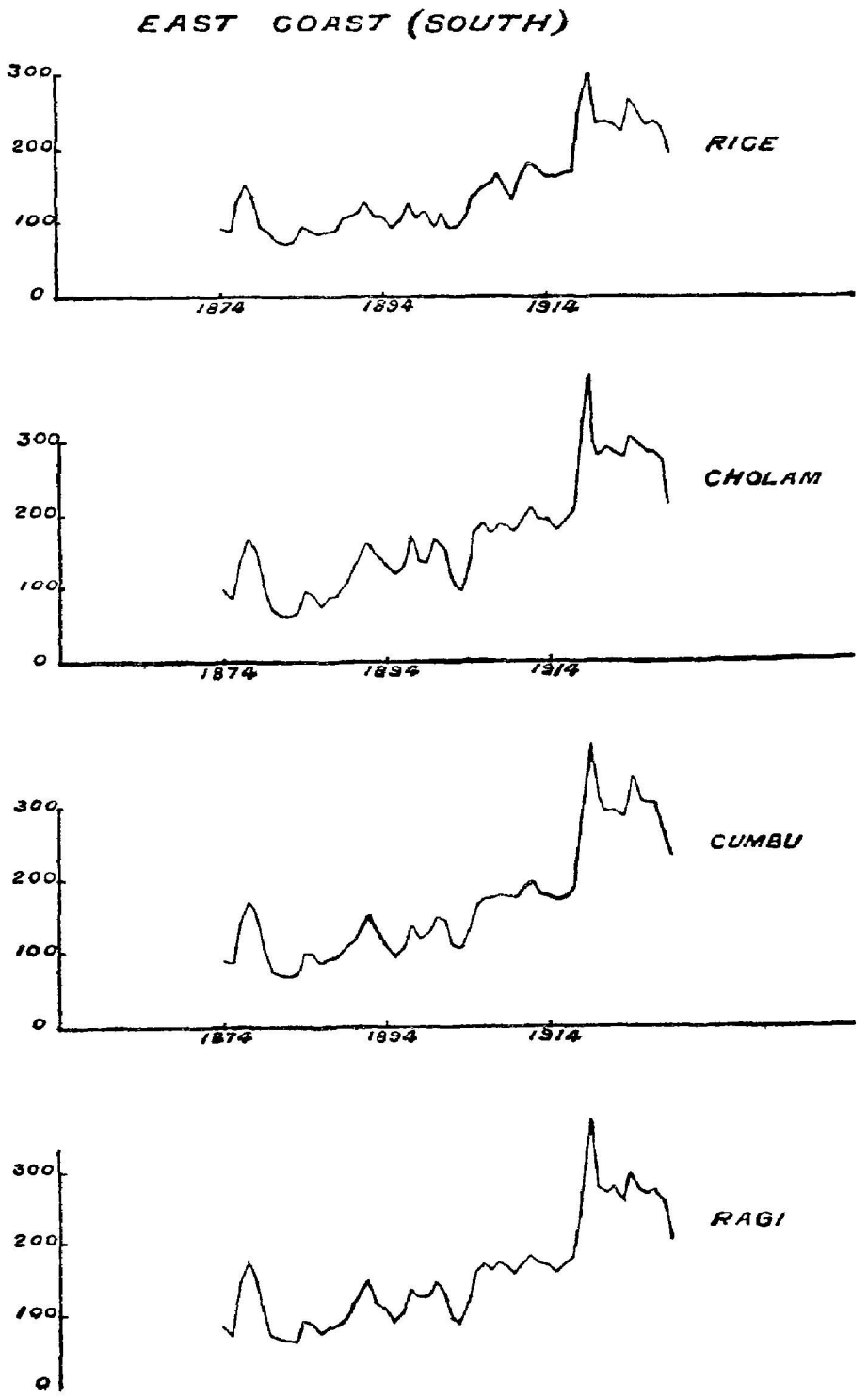
There are some distinct advantages in plotting the indices of prices on a logarithmic scale. In the first place, we are

able to see whether the fluctuations in the prices of one commodity have on the whole been more or less than those of another more clearly than when the indices have been plotted in the ordinary way; in the second place, a curve plotted on a logarithmic scale enables us to compare the rise or fall of prices in two different periods of time by merely comparing two vertical distances on the logarithmic chart. If, for instance, the percentage rise in prices has been the same in two different periods of time, these two rises correspond to two equal vertical increments corresponding to the two periods. Suppose a change I_2 from I_1 in the first period of time has to be compared with a change I_4 from I in the second period of time, where I_1, I_2, I_3 and I_4 are any four indices of prices. On the logarithmic chart, log I_1, log I_2, log I_3 and log I_4 are plotted instead of the I's. It is known from the theory of logarithms that log (I_2/I_1) = log I_2 − log I_1, and log (I_4/I_3) = log I_4 − log I_3 so that if the differences log I_2 − log I_1, and log I_4 − log I_3, which correspond to the two vertical increments on the logarithmic chart are equal, the two ratios I_2/I_1 and I_4/I_3 are equal, which proves that the percentage increase in the two periods of time has been the same. And by referring to a supplementary scale which is appended to the logarithmic chart we can find out what the percentage increase or decrease of price has been in a particular period.

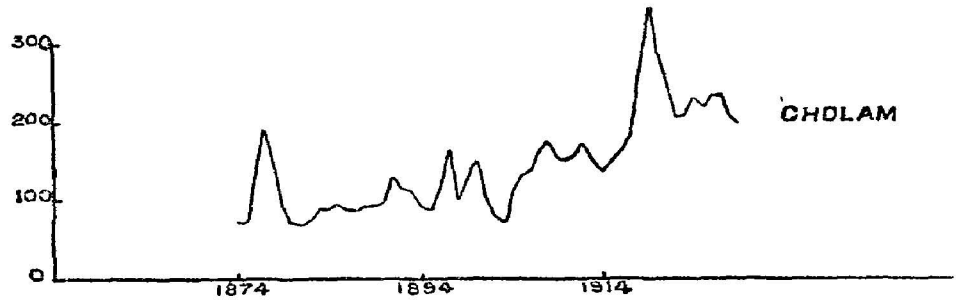
To elucidate this point further, I would ask the reader to confine himself to two periods of time (1) 1903 to 1908 and (2) 1914 to 1919 and refer to my two curves of indices of prices of rice for the Madras Presidency plotted in (1) the arithmetical and (2) the logarithmic scale. He would see that the indices in the four years are 96, 168, 158 and 280 respectively. Thus while the percentage increase of price in the period 1903-1908 has been very nearly the same as the increase in the period 1914-1919 as shown by the logarithmic curve, if we were to compare the ordinates given by the first curve we would see that the difference of ordinates in the latter period is more than one and a half times the difference of ordinates in the first period and this is sometimes apt to be misleading as one in comparing two periods

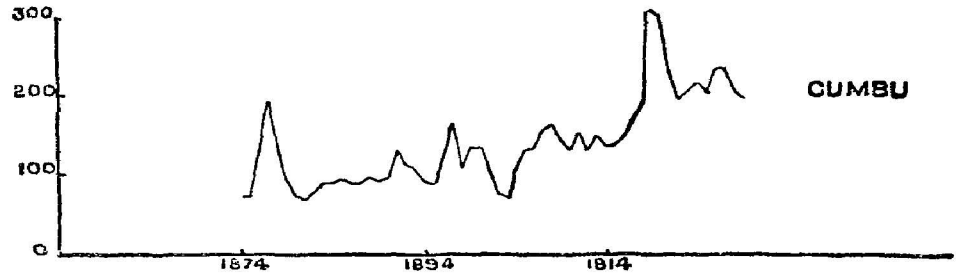
of time may associate a greater difference of ordinates in one period (the difference becomes huge when the indices are great) with a greater percentage increase when actually the percentage increase may be the same. The same length would, for instance, correspond to an increase from say 100 to 150 as to an increase from say 1000 to 1500 in the logarithmic chart, but in the arithmetical chart, the latter difference would be denoted by ten times the length of the first difference and this may mislead a superficial observer of the chart. And this is the great advantage of plotting indices on a logarithmic scale—once they are so plotted the percentage increase or decrease can be read off directly by reference to an appended scale, and without going through the sometimes irksome process of calculating these percentages.

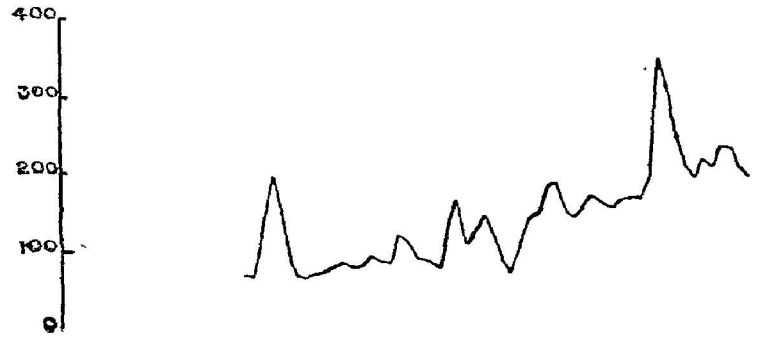
Certain conclusions, which it is otherwise not so easy to draw can be drawn from a glance at the logarithmic curves of foodprices for the Madras Presidency. (1) The fluctuations in the prices of rice have on the whole been less than the fluctuations in the prices of the other foodgrains. (2) The increase of prices from 1888 to 1914, a period of 27 years has been more or less the same as the increase from 1916 to 1919 a period of 4 years for all the four foodgrains. (3) Prices have on the whole been more stable in the decennial period following the year 1919, the year of maximum prices than in any other decennial period.

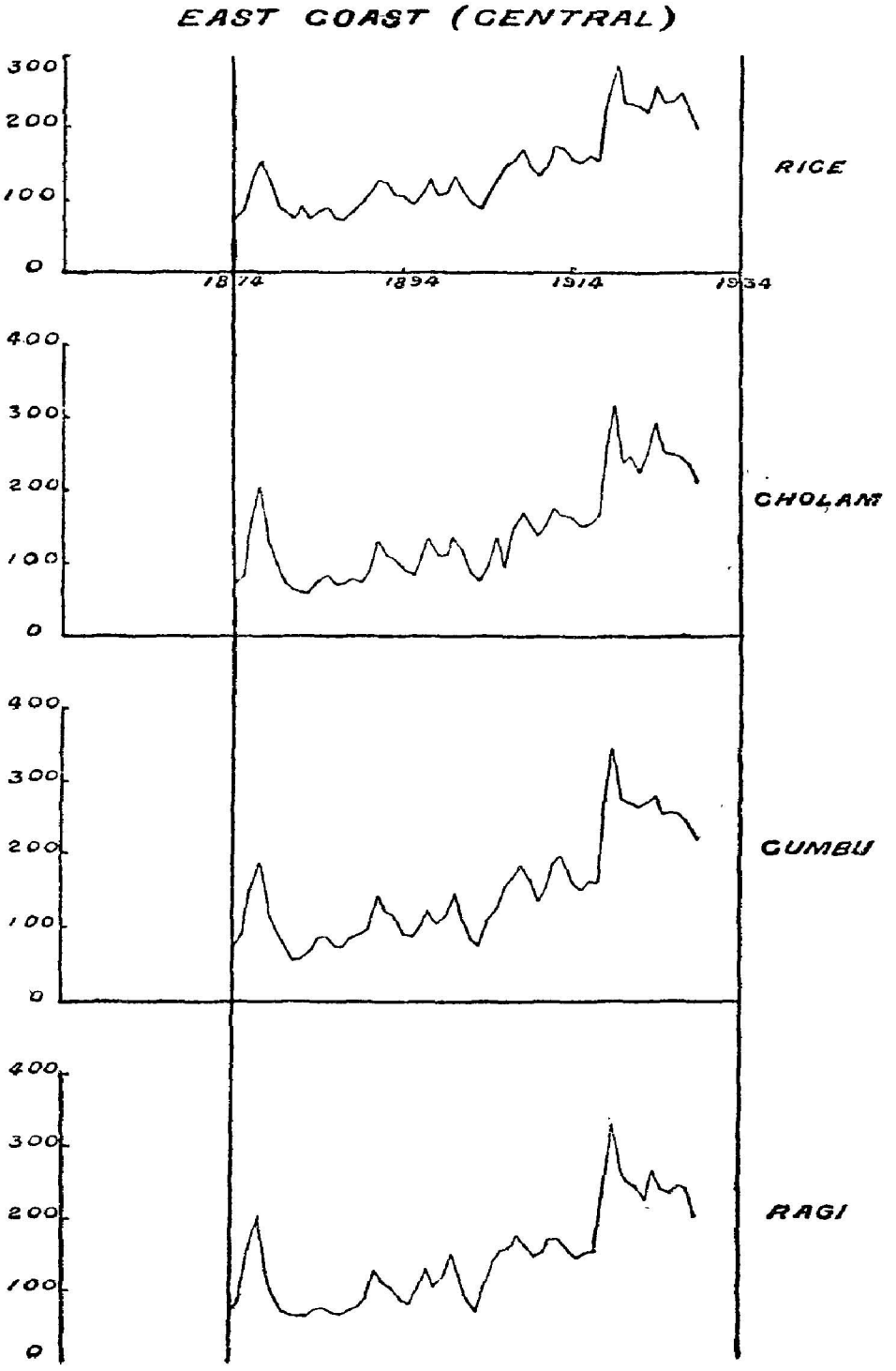

EAST COAST (SOUTH)
300
200
100
0
1874
1894
1914
RICE
CHOLAM
CUMBU
RAGI

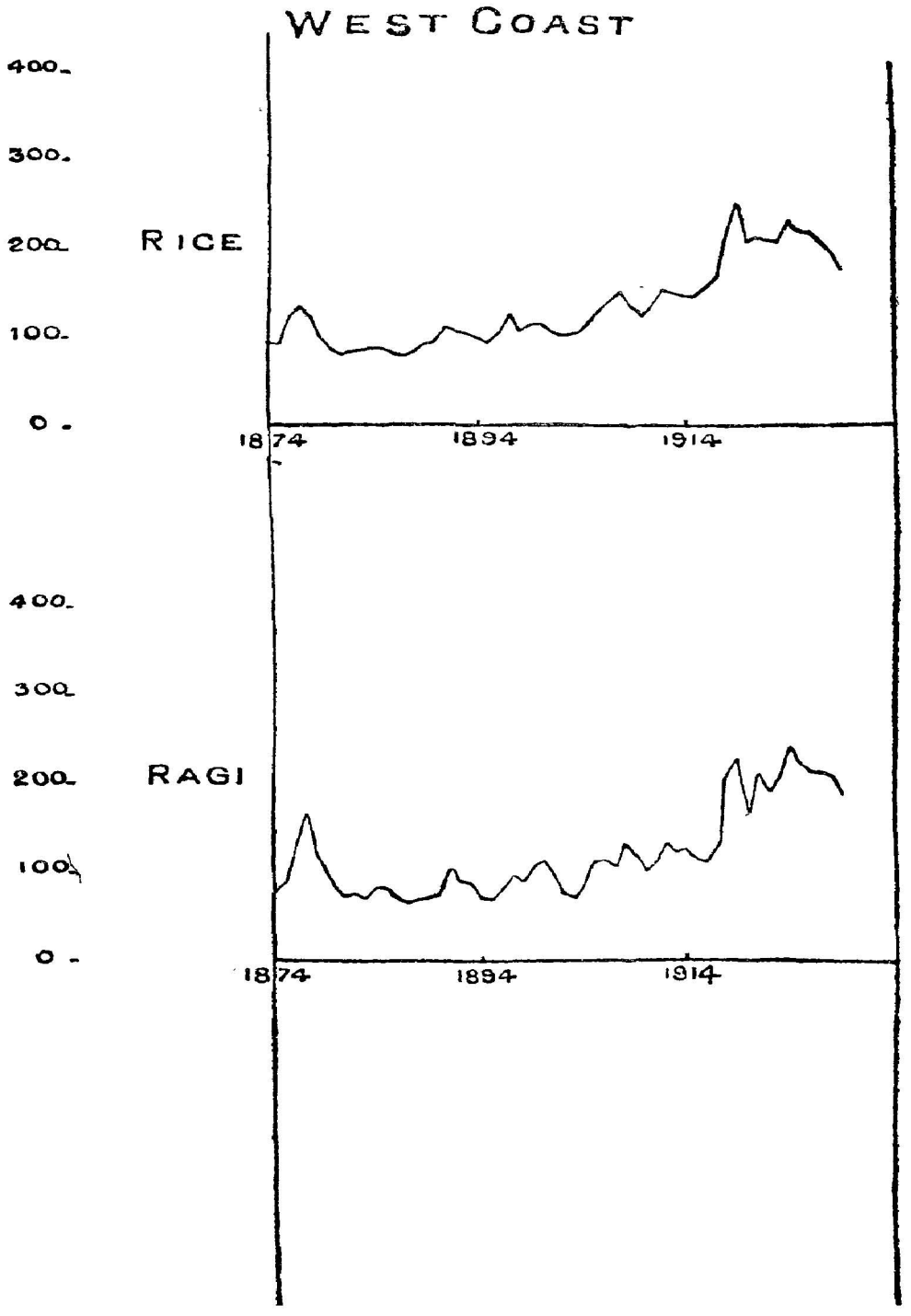
EAST COAST (NORTH)

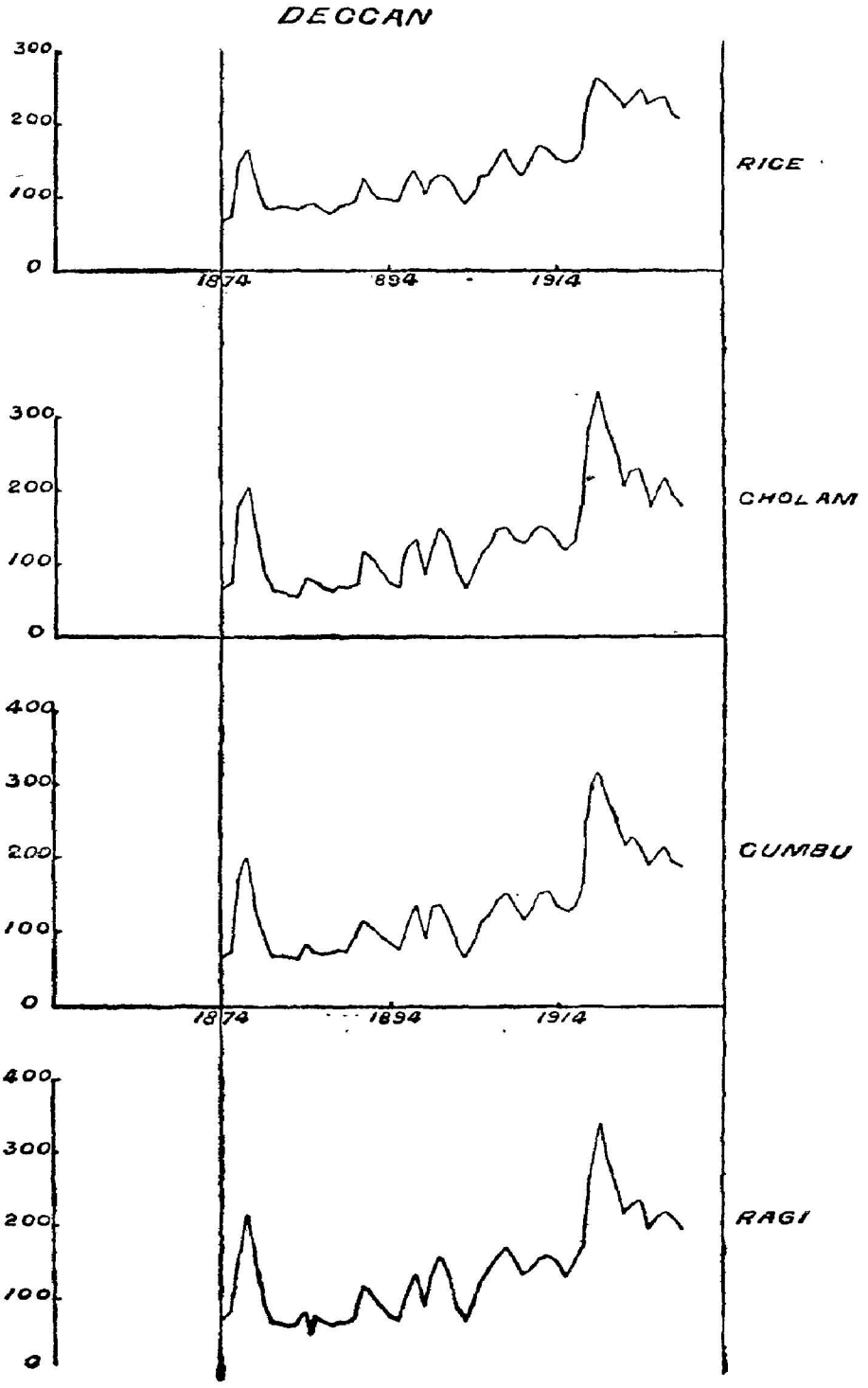







EAST COAST (CENTRAL)
300
200
100
0
1874
1894
1914
1934
RICE
400
300
200
100
0
CHOLAM
400
300
200
100
0
CUMBU
400
300
200
100
0
RAGI


WEST COAST
400.
300.
200.
100.
0.
RICE
1874
1894
1914
400.
300.
200.
100.
0.
RAGI
1874
1894
1914


DECCAN
300
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100
0
1874
1894
1914
RICE
300
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0
CHOLAM
400
300
200
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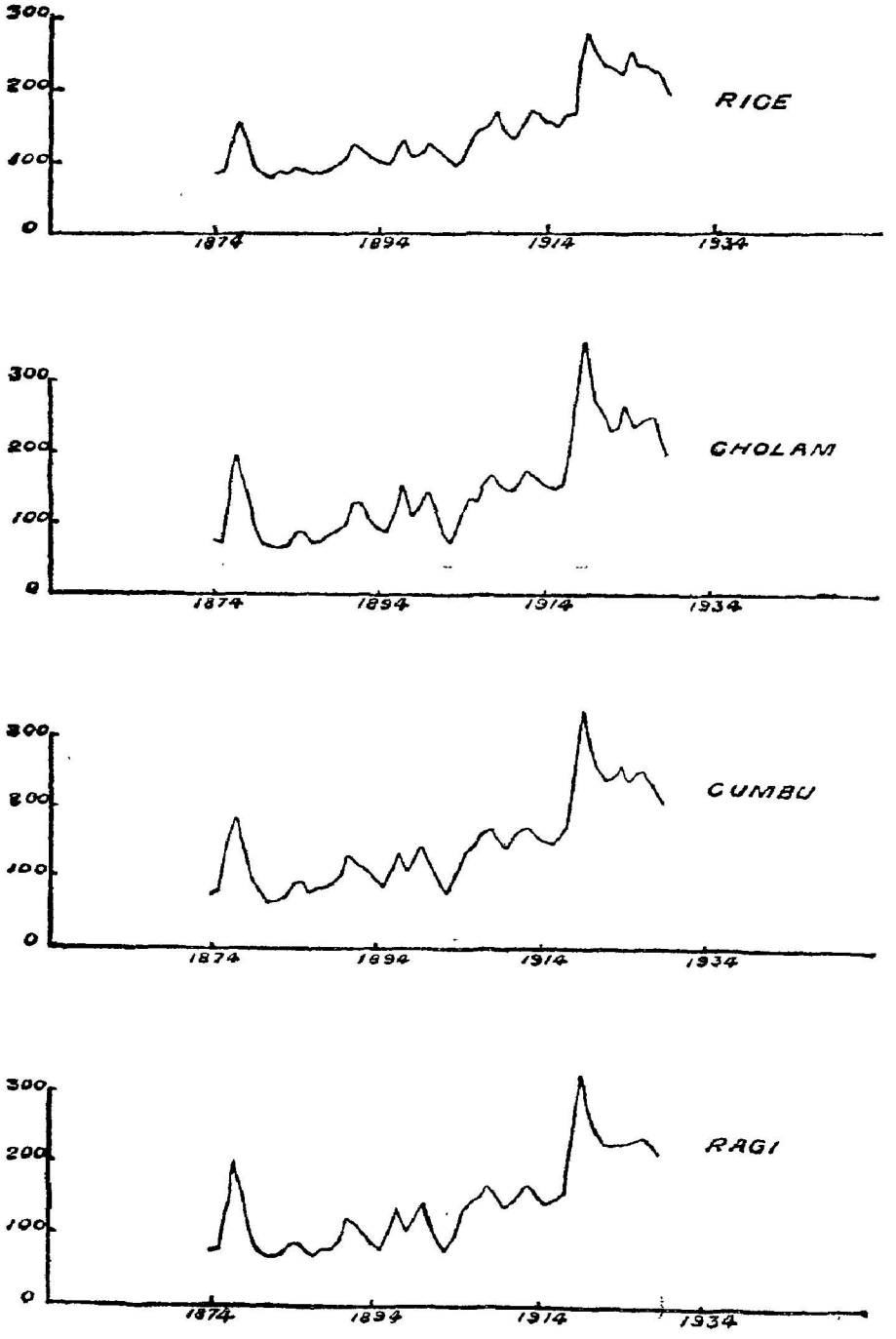
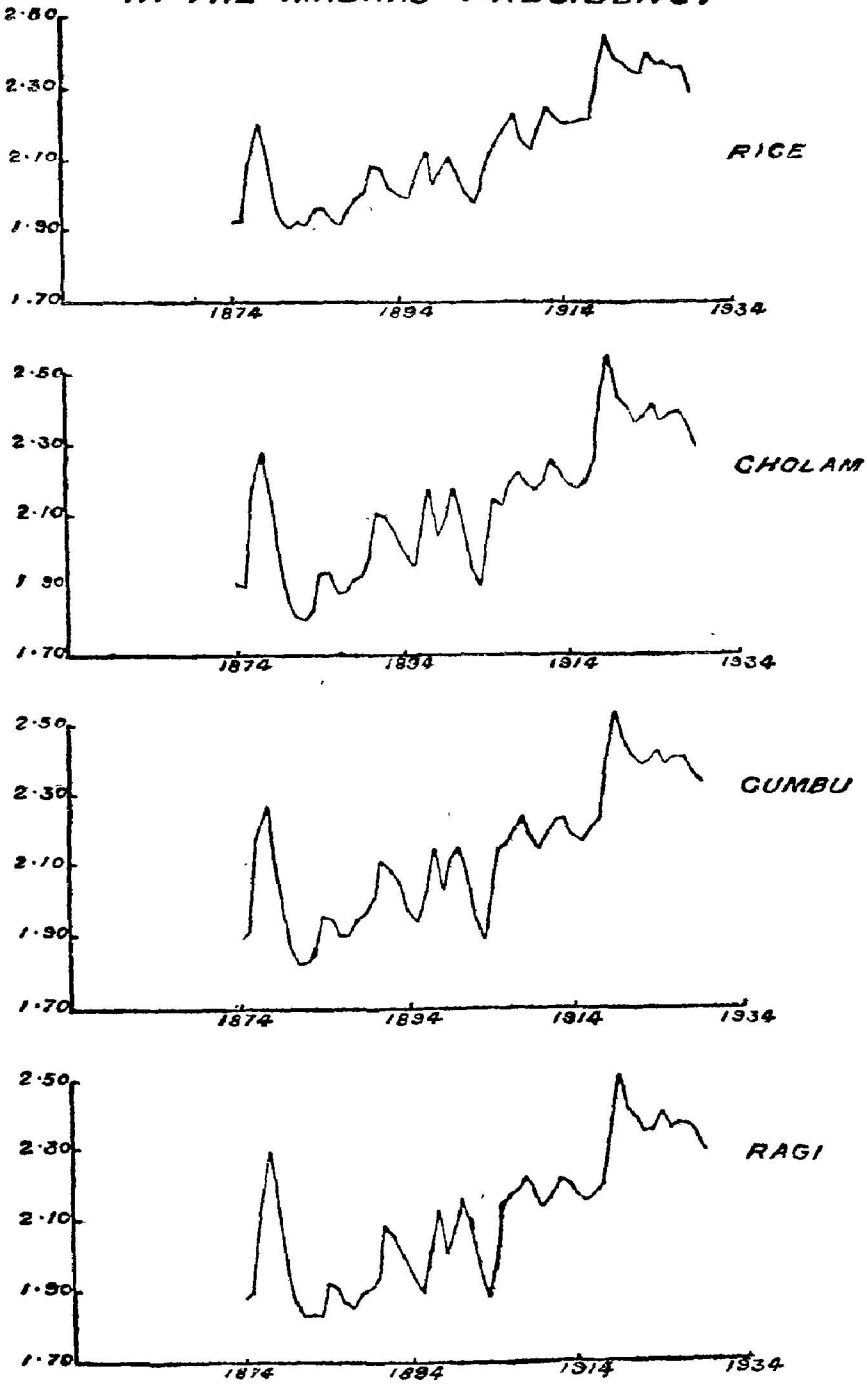
0
1874
1894
1914
CUMBU
400
300
200
100
0
RAGI

CURVES OF FOOD PRICES IN THE MADRAS PRESIDENCY



LOGARITHMIC CURVES OF FOOD PRICES IN THE MADRAS PRESIDENCY



THE HISTORY OF AUCITYA IN SANSKRIT POETICS

BY

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One of the noteworthy points in the Sanskrit systems of literary criticism is that, in an inquiry into a comprehensive philosophy of art, they do not separate poetry and drama, nor prose and verse. Bharata, the father of Sanskrit Dramaturgy and Poetics, has defined Drama as Imitation of the three worlds or representation of the actions of men of various nature: त्रैलोक्यानुकृतिः or धीरोदात्ताद्यवस्थानुकृतिः (N. S. I, 107, 113, 120 etc. Vide also Daśarūpaka I, 7). Consequently Bharata has perfected a system of ideas of 'Loka Dharmī', which term means 'the ways of the world' or to put it short 'Nature', and stands to denote the realistic elements in Bharata's Stage.[1] In the concept of Prakṛti, Bharata studies the various kinds of men, minds, and natures found in the worlds. In the concept of Pravṛtti he has studied the provincial, racial, and national characteristics in dressing and other activities. He has elaborately dealt with Āhārya-abhinaya, dress and make-up, which, he says, must be appropriate to the Rasa and Bhāva.

एतद्विभूषणं नार्या आकेशादानखादपि ।
यथाभावरसावस्थं विज्ञायैवं प्रयोजयेत् ॥ N. S. XXIII., 42.

He has devoted separate sections to a consideration of the most proper way of correct speaking in the drama according to the emotions (xix, पाठ्यगुणाः), of the Svaras suitable for each mood and of the musical tunes, Jātyaṅgakas, appropriate to the varying Rasa and Bhāva (xxix, 1-4). These

[1] An article of mine on Loka Dharmī (Realism) and Nāṭya Dharmī (Conventions and Idealism) of Bharata's Stage will be published soon in the *Journal of Oriental Research,* Madras.

remarks apply to the artists of the stage and theatre, the actors, the conductor and others. Regarding the work of the poet-dramatist, Bharata has analysed the text of the drama and has pointed out how the verbal qualities of sweetness, harshness etc., and the flights of fancies expressed in the form of figures of speech have to be appropriate to that Bhäva or Rasa which is portrayed. (xvii, 108-123). Thus at the end of the treatment of each topic, Bharata has an important section called 'Rasa-prayoga', where he points out what suits what.

So much so that Bharata observes that, in judging drama, the ground of reference of success of art is the world. He emphasises that one has to know the infinite variety of human nature—Prakṛti and Sīla, on which is Nāṭya or drama based.

नानाशीलाः प्रकृतयः शीले नाट्यं प्रतिष्ठितम् ।

The 'Pramāṇa' of Nāṭya is finally only the world. A theorist can give a few indications and the rest can be learnt only from the world.

लोकसिद्धं भवेत् सिद्धं नाट्यं लोकस्वभावजम् ।
तस्मान्नाट्यप्रयोगे तु प्रमाणं लोक इष्यते ॥

* * * *

यानि शास्त्राणि ये धर्माः यानि शिल्पानि याः क्रियाः ।
लोकधर्मप्रवृत्तानि तानि नाट्यं प्रकीर्तितम् ॥

न हि शक्यं हि लोकस्य स्थावरस्य चरस्य च ।
शास्त्रेण निर्णयं कर्तुं भावचेष्टाविधिं प्रति ॥

नानाशीलाः प्रकृतयः शीले नाट्यं प्रतिष्ठितं ।
तस्माल्लोकःप्रमाणं हि कर्तव्यं नाट्ययोक्तृभिः ॥

N. S., XXVI, 113-119.

नोक्तानि च मया यानि लोकग्राह्यानि तान्यपि । N. S., XXIV., 214. (end of the chapter on dress and make-up). Nature or the three worlds or Prakṛti or Sīla—all these can finally be referred to by the single word Rasa which is the 'Soul' of

poetry. Drama is the representation of moods, Bhāva-anukīrtana, as Bharata puts it. Out of these moods flow everything—the actions, the character, the dress, the nature of one's speech etc. Thus to this factor, which is at the root of all these things, *viz.*, Rasa, have these things again to be referred for finding out whether in representing them, there is propriety or appropriateness. Things cannot be estimated by themselves separately and labelled as good or bad, appealing or otherwise. That is, Guṇatva and Doṣatva do not inherently pertain to anything eternally but anything, according to the situation where it occurs, is either suitable or not; and in this suitability or otherwise lies Guṇatva or Doṣatva. What Bharata says of ornaments and decoration in the make-up of the characters is true of all other parts of the art of representation by the poet and the production of the drama on the stage by the actors. Bharata lays down that if a thing does not agree or is not proper in a certain place with reference to Rasa, it is the greatest literary flaw. Improper placing, like placing a necklace at the foot and an anklet round the neck, can only produce laughter.

अदेशजो हि वेषस्तु न शोभां जनयिष्यति ।
मेखलोरसि बन्धे च हास्यायैवोपजायते ॥

N. S., XXIII., 69.

It is a serious breach of propriety for a writer to describe a forlorn lady suffering from separation from her lord (*i.e.*, one in Pravāsa Vipralambha) as having her body fully decked with jewels. In the realm of artistic expression the same rule holds good. A poet commits the greatest crime against Rasa if he introduces a cartload of ornaments of a verbal character in places where Rasa has to be effectively portrayed and where the absence of any figure is itself the perfection of art. The proper placing of things in such a manner as to suit Rasa and the avoiding of things not suitable form the essence of artistic expression. This is propriety, Aucitya. An anklet adds no beauty as an ornament but an anklet as an ornament for the ankle is helpful to beautify one. We can thus see how this doctrine of appropriateness, propriety and adaptation —all comprehended in the one word Aucitya, is directly

derivable from Bharata. Just put by the side of the verse of Bharata above-quoted, the verse illustrative of the theory of Aucitya quoted by Kṣemendra in his Aucitya vicāra carcā, in which text the doctrine of Aucitya had the complete elaboration into a system of criticism, and see:

अदेशजो हि वेषस्तु न शोभां जनयिष्यति ।
मेखलोरसि बन्धे च हास्यायैवोपजायते ॥

Bharata, xxiii, 69.

कण्ठे मेखलया, नितम्बफलके तारेण हारेण वा
पाणौ नूपुरबन्धनेन, चरणे केयूरपाशेन वा ।
शौर्येण प्रणते, रिपौ करुणया, नायान्ति के हास्यतां
औचित्येन विना रुचिं प्रतनुते नालंकृतिर्नो गुणाः ॥

Kṣemendra's Au. V.C.

Thus the first work in the history of Sanskrit Poetics contains *implicitly* as much of this theory of Aucitya of the Sanskrit Alaṅkāra Sāstra, as of the other theory of poetry, Rasa, explicitly, even though emphasis on both these—Aucitya and Rasa—was again systematically laid only as late as the ninth, tenth, and eleventh centuries.

Aucitya is harmony and in one aspect it is proportion between the whole and the parts, between the chief and the subsidiary, between the Aṅgin and the Aṅgas. This perfection is all the morals and beauty in art. At the final stage of its formulation as a theory explaining the secret of poetic appeal, Aucitya is stated as the 'Jīvita', life-breath, of poetry. This Aucitya, which is proportion and harmony on one side and appropriateness and adaptation on the other, cannot be understood by itself but presupposes that to which all other things are harmonious and appropriate. Surely there has to be harmony and appropriateness in every part and between one part and another; but everything as a whole has to be pronounced proper and appropriate or otherwise by a reference to what constitutes the 'Soul'—Ātman of all art (here, of course, poetry) *viz.*, Rasa. Thus Bharata speaks of the Rasa-prayoga of Pravṛtti, Vṛtti, Guṇa, Alaṅ-

kāra, Āhāryabhinaya, Pāṭhyaguṇa, Svara and Jātyaṅga. In later terminology, this Rasa-prayoga is Rasa-aucitya. But, Aucitya is only implicitly contained in Bharata. It was only rather late that Poetics got itself again wedded and identified with Bharata's Dramaturgy and took its stand scientifically on the two pedestals of Rasa and Aucitya, which it had forgotten for a time, as we shall now see in the following account of the history of the concept of Aucitya after Bharata.

Māgha

The next glimpse we have of Aucitya is in Māgha, who, in his poem, has made some side-remarks which shoot their rays into the darkness of the early history of Poetics. In canto ii of Māgha's Śiśupālavadha we have a verse on the policy best suited for the king, which, through comparison, drags in the topic of Guṇas in Kāvyas or dramas.

तेजः क्षमा वा नैकान्तं कालज्ञस्य महीपतेः ।
नैकमोजः प्रसादो वा रसभावविदः कवेः ॥ S. V. II., 83.

The king has to achieve his purpose with an eye on expediency. Time and circumstance are the pre-eminently deciding factors of his policy. There is no inherent good in either power or forbearance and peace by themselves but all goodness of a policy consists in its effectiveness, in using that which is suited to the time. Prowess is waste and will even ruin the cause where it is needlessly flaunted. Forbearance cannot help the king when he has to succeed by putting up a thick fight. Thus, adaptation is the only policy good for the king. The case is similar to that of a poet with whom the main concern is Rasa and Bhāva and an understanding of their subtle nature. In portraying his characters and their actions and in describing them, it will not do if the poet sticks to one quality throughout, say Prasāda or Ojas. When the Vira, Adbhuta and Raudra Rasas appear, he has to adopt the Guṇa Ojas to suit the vigour, energy and blaze (Dīpti) of those Rasas and when the key of emotion is lowered and quiet emotional effects have to be produced, the requisite quality for the poet is Prasāda. Thus, not Guṇas by themselves, but that Guṇa which is proper and appropriate —Ucita—is helpful to Rasa. This is Guṇa-aucitya. Auci-

tya is here Adaptation. Māgha, as a poet, had this clear insight into Bharata's ideas of Rasa and Guṇas appropriate to each Rasa. Bhoja considers such appropriateness in expression between the emotion and the stylistic quality as a Prabandha-guṇa, *i.e.*, one of the good features of good poetry. He calls it 'रसानुरूपसन्दर्भत्वं'. He means the same thing as what Māgha says in the above-given verse, which also Bhoja quotes.

"रसानुरूपसन्दर्भत्वमित्यनेन रतिप्रकर्षे कोमलः, उत्साहप्रकर्षे प्रौढः, क्रोधप्रकर्षे कठोरः, शोकप्रकर्षे मृदुः, विस्मयप्रकर्षे तु स्फुटशब्दसन्दर्भो विरचनीय इति उपदिशन् 'नैकमोजः प्रसादो वा रसभावविदः कवेः'

(Māgha, S. V. II., 83).

इति ख्यापयति ।"

Śṛṅgāra Prakāśa; Madras MS. Vol. II, p. 432.

In the above-given verse of Māgha we have an early 'Sīrodaya' of the doctrine of Guṇas as the Dharmas of Rasa, the Soul of Kāvya, which is one of the special contributions of Ānandavardhana. In later terminology, Māgha is here speaking of वर्णसंघटना – औचित्य, appropriateness of letters and collocation, or simply गुणौचित्य.

Bhāmaha and Daṇḍin

It is again in respect of Guṇas that we have a faint glimpse of the idea of Aucitya implied in certain parts of the treatises of Bhāmaha and Daṇḍin. Māgha says that Guṇas must change and be appropriate to the Rasa and the Bhāva of the situation. Ojas or Prasāda wrongly placed is a literary flaw, directly hindering Rasa. Thus the breach of Aucitya gives rise to flaws. In one way, the greatest Guṇa or excellence of poetry is only Aucitya and it comprehends all other Guṇas; and the greatest Doṣa or flaw comprehending other flaws is Anaucitya. Thus when the Rīti is not suited to the Rasa, we can say that there is Rīti-anaucitya and a Doṣa called Arītimat. But the Gouḍī Rīti which may not suit Śṛṅgāra cannot be condemned altogether as eternally unsuited to all poetry. The Gaudī Rīti is the only Rīti that can effectively suggest Vīra, Adbhuta,

and Raudra Rasas and in the cases of these three the Vaidarbhī so suggestive of Śṛṅgāra is perfect Anaucitya. There may be harsh sounds and heavy, long and swollen utterances in a highly worked-up emotion of the kind of Raudra; the harsh sounds which suggest the Rasa in this case must be avoided by the poet in Śṛṅgāra Rasa which is suggested by sweet assonances and delicate sound effects. Therefore it is that the Doṣas, given as such in separate sections by Bhāmaha and Daṇḍin, are, to use a word which came into currency only after Ānandavardhana, Anitya. That is, in certain circumstances Doṣas cease to be so; there are no fixed Guṇas or Doṣas; what is Guṇa in one case is Doṣa in another and vice versa.

In chapter I Bhāmaha deals with certain Doṣas in the last section beginning with śl. 37. After defining and illustrating them he says that these flaws cease to be so sometimes and really give beauty to expression.

सन्निवेशविशेषात्तु दुरुक्तमपि शोभते ।
नीलं पलाशमाबद्धं अन्तराले स्रजामिव ॥
किञ्चिदाश्रयसौन्दर्यात् धत्ते शोभामसाध्वपि ।
कान्ताविलोचनन्यस्तं मलीमसमिवाञ्जनम् ॥

* * *

अनयान्यदपि ज्ञेयं दिशा युक्तमसाध्वपि ।

* * *

यथा तद्वदसाधोयः साधोयश्च प्रयोजयेत् ॥

The principle behind these observations is Aucitya, adaptation. Again, in Chapter IV Bhāmaha speaks of such flaws in poetry as Lokavirodha. The flaw of Lokavirodha, which is going against nature, is nothing but the non-observance of the Aucitya of Prakṛti etc. Here, he also points out that redundance, Punarukti, which is generally a flaw in expression turns out to be an effective way of expression in fear, sorrow, jealousy, joy and wonder.

भयशोकाम्यसूयासु हर्षविस्मययोरपि ।
यथाह गच्छ गच्छेति पुनरुक्तं न तत् विदुः ॥ IV., 14.

It is in the same section on Doṣas that the principle of Aucitya is implied in Daṇḍin's work also. Daṇḍin treats of Doṣas in the fourth chapter of his work. Each and every Doṣa is given with a qualification that in certain circumstances it ceases to be Doṣa and turns out to be a Guṇa. Thus Apārtha, the first flaw is generally a Doṣa but it is the most proper means of successfully portraying a madman's raving, a child's sweet prattle or the speech of a sick man.

समुदायार्थशून्यं यत् तदपार्थमितीष्यते ।
उन्मत्तमत्तबालानां उक्तेरन्यत्र दुष्यति ॥ IV., 5.

* * *

इदमस्वस्थचित्तानामभिधानमनिन्दितम् । IV., 7.

Speaking of the flaw of Viruddhārtha or Vyartha, Daṇḍin says that there is such a state of mind also in which even contradictory speech is the natural mode of expression and hence, in those places the flaw becomes an excellence.

अस्ति काचिदवस्था सा साभिषङ्गस्य चेतसः ।
यस्यां भवेदभिमता विरुद्धार्थापि भारती ॥ IV., 10.

Punarukta as has been pointed out by Bhāmaha also, is no flaw but is an effective way of expressing compassion or any stress of emotion which needs repetition. Samśaya or the use of doubtful or ambiguous words may generally be a flaw but when such words are wilfully used, as is often needed in the world, they are perfect Guṇas. Thus Daṇḍin shows exceptions—Vyabhicāra—to all the Doṣas. He is fully aware, that in the realm of poetry, a certain thing is not Doṣa by its very nature but that it is so because of circumstance, a change of which makes it a Guṇa. He thus finally concludes :

विरोधस्सकलोऽप्येष कदाचित्कविकौशलात् ।
उत्क्रम्य दोषगणनां गुणवीथीं विगाहते ॥ IV., 5-7.

Bhoja developed the same idea by constituting under the head 'Guṇa' a peculiar class of Guṇas called the Vaiśeṣika Guṇas. These are the flaws above noticed which Bhāmaha and Daṇḍin considered as excellences sometimes. (Vide the

Sarasvatīkaṇṭhābharaṇa, chapter I. Sls. 89-156, pp. 78-119).[1] Bhoja calls them also Doṣaguṇas. As a matter of fact, all Guṇas and Doṣas are 'Vaiśeṣika'. 'It all depends', says the discerning critic in literature as one says in this complex world. The fact of Doṣas becoming Guṇas recorded by Bhāmaha and Daṇḍin means, if it means or implies anything, the doctrine of Aucitya as the only ruling principle holding good in the kingdom of poetry for ever. It is because of this that, in Poetics, Doṣas are called Anitya. It is only a clearer statement of what Daṇḍin has said in the Doṣa-section that we have in Ānandavardhana and Abhinavagupta, who say :

श्रुतिदुष्टादयो दोषा अनित्या ये च सूचिताः ।
ध्वन्यात्मन्येव शृङ्गारे ते हेया इत्युदीरिताः ॥ Dhva. Ā. II., 12.

"नापि गुणेभ्यो व्यतिरिक्तं दोषत्वं । बीभत्सहास्यरौद्रादौ त्वेषां (श्रुतिदुष्टादीनां) अस्माभिरुपगमात्, शृङ्गारादौ च वर्जनात् अनित्यत्वं समर्थितमेवेति भावः ।" Locana.

The principle by virtue of which 'harsh sounds'—Śrutiduṣṭa—which form a Doṣa to be avoided in Śṛṅgāra become themselves a Guṇa highly suggestive of Raudra etc., is Adaptation or Aucitya. (Vide also Dhva. Ā. III. 3-4).

Yaśovarman, author of the drama Rāmābhyudaya

In the first half of the 8th century, King Yaśovarman of Kanauj, patron of Bhavabhūti, wrote his drama Rāmābhyudaya, whose prologue has some interest to the student of the history of Poetics for a verse in it on certain concepts connected with theoretical literary criticism. That veritable mine of quotations, the stupendous Śṛṅgāraprakāśa of King Bhoja, quotes that verse. Bhoja considers a number of Alaṅkāras of Prabandha, *i.e.*, good features of a poem or a drama as a whole. One of these Prabandhālaṅkāras is given by him as 'excellence of build'—सन्निवेश प्राशस्त्यं—which means, according to him, that the minor 'descriptions' in a Mahākāvya must be so set in the framework of the story that they

[1] I have spoken of these at length in a paper of mine on the History of Guṇas which will be published in due course.

do not appear irrelevant or overdone. This is Aucitya in its aspect of proportion, harmony and strict artistic relevancy of all details from the point of view of Rasa. Bhoja means that this applies to drama also as his quotation from Yaśovarman shows.

"तेष्वेव नगरार्णववर्णनादीनां सन्निवेशप्राशस्त्यं अलङ्कार इति। तदुक्तं-

'औचित्यं वचसां प्रकृत्यनुगतं, सर्वत्र पात्रोचिता
पुष्टिः स्वावसरे रसस्य च, कथामार्गे न चातिक्रमः।
शुद्धिः प्रस्तुतसंविधानकविधौ, प्रौढिश्च शब्दार्थयोः
विद्वद्भिः परिभाव्यतामवहितैः, एतावदेवास्तु नः॥[1]

Sṛ. Pra. Mad. MS. Vol. II., p. 411.

This is the earliest instance so far known of the occurrence of the word Aucitya. Yaśovarman here refers to a number of

[1] That this is a verse in Yaśovarman's Rāmābhyudaya is known from the Locana on the Dhva. Ā. III., p. 148. Ānandavardhana quotes from the second line of the above verse, the bit 'कथामार्गे न चातिक्रमः'. Explaining the phrase यदुक्तं which introduces this quotation, Abhinava says: 'यदुक्तमिति। रामाभ्युदये यशोवर्मणा।' There should be a full-stop in the text here and the words स्थितमिति यथा शय्यां in the Locana do not form any quotation, as the N.S. edn. suggests by clubbing them together with यशोवर्मणा and by giving them with quotation marks. The correct text should be स्थितिमिति। कथाशय्यां। स्थितिमिति is a Pratīka and refers to the word Sthiti in Ānanda's Vṛtti 'इतिवृत्तवशायातां कंथञ्चिद्रसाननुगुणां स्थितिं त्यक्त्वा etc. This word Sthiti is interpreted by Abhinava as the course of the story 'कथाशय्या'.

That it is a verse from the prologue can easily be known; for such verses can figure nowhere else. Mark the similarity of this verse to the verse 'यद्वेदाध्ययनं etc.' in the prologue to the Mālatīmādhava of Bhavabhūti who wrote in Yaśovarman's court. Also note in the III line the Guṇa mentioned by Yaśovarman 'प्रौढिश्च शब्दार्थयोः' which Bhavabhūti also mentions. 'यत्प्रौढत्वमुदारता च वचसां'. This seems to have developed into the Prauḍhi forming the Arthaguṇa Ojas in Vāmana, III. ii. 2.

good features which a good drama should have. First among them are Aucitya of expression, *i.e.*, speech written according to the nature and level or rank of the characters and Aucitya of Rasa, *i.e.*, delineation of characters in their proper moods with an eye to developing the Rasa in the proper place. These two comprise the external and internal Aucitya or Aucitya of expression and Aucitya of the content, *i.e.*, the Rasa. On this point Yaśovarman has emphasised only what Bharata has laid down as regards Prakṛti and Śīla. The second mentioned Aucitya of Rasa, its appropriateness to the Pātra, the character and its development in the proper place (पात्रौचित्यं, पुष्टिः स्वात्रसरे रसस्य) are elaborated into many rules of Rasaucitya by Rudraṭa and Ānandavardhana as we shall see in a further section.

It is this all-round Aucitya called by Bhoja an Alaṅkāra and Sanniveśaprāśastyam that Lollaṭa also emphasises. Lollaṭa wants every part of the Mahākāvya to be Rasavat. All these are various ways of putting the idea of Aucitya of Rasa, the 'Soul' of poetry, without basing oneself on which, none can talk of Aucitya intelligibly.

Lollaṭa

In practice, as can be seen from the numerous and large Mahākāvyas which are entitled to that name not because of the innate greatness of their art but because of their bulk, all notions of propriety had become utterly unknown to poets. The several limbs overdeveloped themselves separately, like elephantiac leg, and the Kāvya as a whole was an outrage on harmony and Aucitya. This Lollaṭa severely criticised, perhaps in his commentary on the Nāṭya Śāstra. To this aspect of Aucitya *viz.*, proportion and strict relevancy of every detail, Lollaṭa drew attention. In the gap between Daṇḍin and Rudraṭa, two or three stray verses of Lollaṭa quoted by Rājaśekhara, Hemacandra and Namisādhu give us a flash in the dark and we see how stage by stage the concept of propriety or Aucitya was developing. These three verses of Lollaṭa emphasise Rasaucitya, Aucitya of parts to the chief element called Rasa *i.e.*, the aspect called proportion. Ornaments hide beauty if they are not structural or organic; similarly 'descriptions' have to logically emerge out of the story and the complex

course of its Rasa as a necessity. Descriptive cantos should not stand out like outhouses and isolated places for the poet's mind to indulge at length in excess. This is true of the drama as much as of the epic poem. In a drama, the sub-plots, the Patākā and the Prakarī and the Sandhyaṅgas should not be considered by themselves as having any virtue but should be seen to be relevant to Rasa. This Ānanda-vardhana emphasises, as we shall see. As regards the Mahākāvya, Lollaṭa [Āparājiti *i.e.*, son of Aparājita[1]] says according to Rājaśekhara :

"'अस्तु नाम निस्सीमा अर्थसार्थः; किन्तु रसवत एव निबन्धो युक्तः, न तु नीरसस्य' इति आपराजितिः । यदाह—

'मज्जनपुष्पावचयनसन्ध्याचन्द्रोदयादिवाक्यमिह ।
सरसमपि नातिबहुलं प्रकृतरसानन्वितं रचयेत् ॥
यस्तु सरिदद्रिसागरपुरतुरगरथादिवर्णने यत्नः ।
कविशक्तिख्यातिफलः वितनधियां नो मतस्स इह ॥'"

K.M. I, IX., p. 49.

The second verse in the above quotation, along with its following verse, is quoted by Hemacandra with the mention of the name Lollaṭa. The additional verse quoted by him criticises the poets for setting apart cantos to such feats as Yamaka, Cakrabandha etc., in a Mahākāvya, they being very inappropriate and utterly unhelpful to the emotional idea of the epic poem.

"तथा च लोल्लटः

'यस्तु सरिदद्रिसागरनगतुरगपुरादिवर्णने यत्नः ।
कविशक्तिख्यातिफलो वितनधियां नो मतः प्रबन्धेषु ॥
यमकानुलोमतदितरचक्रादिभिदोऽतिरसविरोधिन्यः ।
अभिमानमात्रमेतत् गड्डुरिकादिप्रवाहो वा ॥' इति ॥"

K. A. Ch. V., p. 215.

Namisādhu, on Rudraṭa III. 59, quotes the additional verse

[1] *Vide* my paper on Writers quoted in the Abhinavabhāratī, *Journal of Oriental Research,* Madras; Vol. VI, Part II, p. 169.

quoted by Hemacandra and emphasises with its authority the principle of Aucitya.

Thus proportion and harmony form an aspect of Aucitya which is propriety, adaptation, and minor points of appropriateness. From the point of view of the perfect agreement between the parts and the chief element of Rasa, from the point of view of this proportion and harmony, I think, Aucitya can be rendered in English into another word also *viz.*, 'Sympathy', which as a word in art-criticism means 'mutual conformity of parts'.

Rudraṭa

From Daṇḍin we had to come down to the time of Lollaṭa before we could again catch sight of Aucitya as a principle underlying many literary dicta. This means that we have to come almost to the time of Ānandavardhana whom Rudraṭa must have slightly preceded. Up to the time of Rudraṭa the concept was developing unconsciously without a name. The name Aucitya was not given to the idea by any writer of poetic theory, and one more useful word was not thus added to the critical vocabulary of the Sahṛdaya. But the word Aucitya must have slowly dawned in the circles of Sahṛdayas and we first see that word used in theoretical literature only in Rudraṭa's Kāvyālaṅkāra, a work which has not yet left the primitive Alaṅkāra-stage of criticism but has however embodied into itself a good deal of the concept of Rasa, which alone, according to it, made poetry that interesting and charming thing it is—Sarasa. The word Aucitya occurs often in Ānandavardhana's work and Rudraṭa is only the first writer to mention it in theoretical literature. For earlier, in the first half of the eighth century, King Yaśovarman of Kanauj uses the word Aucitya with much theoretical significance, in much the same significance as the word is used with in later times, in the prologue of his lost drama, Rāmābhyudaya, as we have noticed above. Thus the three stages to be noticed in the appearance of the name Aucitya is its mention by Yaśovarman, treatment of it to a small extent in Rudraṭa and to a large extent in Ānanda's Dhvanyāloka. Rudraṭa just preceded Ānanda or was an early contemporary of his. He was perhaps writing in Śaṅkuka's time. Some ideas given in the Dhva. are already

seen in Rudraṭa's work. Many of the Rasa doṣas mentioned by Ānanda under Rasaucitya in Uddyota iii are found in Rudraṭa's K. A. What we must note here at present is that though Rudraṭa treats of Alaṅkāraṣ so largely and though his work is yet one of the old period in which works are called Kāvya-*Alaṅkāra,* he has realised the importance of Rasa to suit which Alaṅkāras exist. If Alaṅkāras are otherwise they have little meaning. That is what Ānanda develops in a section on Alaṅkārasamīkṣā in Uddyota ii. The idea that Rasa and Rasaucitya control Alaṅkāra is already seen in Rudraṭa, who, as said above, is the first writer of Poetics to mention the word Aucitya. After dealing with some Śabdālaṅkāras like Yamakas which are a siren to the easily tempted poets, Rudraṭa says, by way of closing the chapter that these figures must be introduced after bestowing due thought on propriety, Aucitya, with reference to the main theme. Even the Anuprāsas have to be now cast away and now taken and must be sparsely used with much advantage. They must not be thickly overlaid upon the theme through the whole length of it.

एताः प्रयत्नादधिगम्य सम्यक्
औचित्यमालोच्य तथार्थसंस्थम् ।
मिश्राः कवीन्द्रैरघनाल्पदीर्घाः
कार्या मुहुश्चैव गृहीतमुक्ताः ॥ K. A. II., 32.

This is Aucitya of Alaṅkāra which Ānanda elaborates in Uddyota ii of his work. It is this idea in the last line of Rudraṭa's verse quoted above— 'गृहीतमुक्ताः' that Ānanda has formulated into the rule—'काले च ग्रहणत्यागौ'—(II. 19) taking and throwing away according to the circumstances, as regards the use of figures.

The word Aucitya again occurs at the end of the next chapter in Rudraṭa's work where again Rudraṭa points out the danger of Yamaka etc. He says that they must be approached only by him who knows Aucitya. Namisādhu perfectly understands the full implication of Rudraṭa's strictures on Yamaka etc., and quotes on this subject of Aucitya

the verse of Lollaṭa which we considered in a previous section. Rudrata says :

इति यमकमशेषं सम्यगालोचयद्भिः
सुकविभिरभियुक्तैः वस्तु च **औचित्यविद्भिः** K. A. III., p. 36.

"तथा च वस्तु विषयभागमालोचयद्भिः । यथा कस्मिन् रसे कर्तव्यं, क्व वा न कर्तव्यं । यमकश्लेषचित्राणि हि सरसे काव्ये क्रियमाणानि रसखण्डनां कुर्युः । विशेषतस्तु शृङ्गारकरुणयोः । कवेः किलैतानि शक्तिमात्रं पोषयन्ति, न रसवत्तां । यदुक्तं 'यमकानुलोम + गड्डरिकादिप्रवाहो वा ॥' (Lollaṭa).

* * * औचित्यं यमकादिविधानास्थानस्थानादिकं
* * * । तदनु चौचित्यविज्ञानानन्तरं विरचनीयम् ।"

Namisādhu.

Besides the mention of the word Aucitya and the presence of the idea of Alaṅkāraucitya in the two places above referred to, Rudraṭa speaks of the adaptation-aspect of Aucitya also implicitly like Daṇḍin while dealing with Doṣas, which, in certain cases become Guṇas. (Vide Chap. vi, Sl. 8). Under the Doṣa called Grāmya, Rudraṭa speaks of propriety in addressing persons of differing ranks which Bharata deals with at length as a part of Prakṛtyaucitya. Explaining another variety of the Doṣa called Grāmya, *viz.*, the Asabhya in VI, 21-24, Rudraṭa says that there are certain words which are inappropriate—Anucita—but which in certain special cases become very appropriate—Ucita. 'अनुचितभावं मुञ्चति तथाविधं पदं सदपि।' He again uses the idea of 'Ucitānucita' in the next variety of Grāmya. He then points out like Daṇḍin how all Doṣas like Punarukta etc., become Guṇas elsewhere. (VI, 29-39). Finally, Rudraṭa says that almost all kinds of flaws become excellences when occasion needs the 'imitation'—Anukaraṇa—of those flaws. That is, the poet and the dramatist have to depict an infinite variety of men and nature in diverse and complex circumstances. When a madman has to be represented his nonsense has to be 'imitated' and it is itself 'sense' for the artist here. This was pointed out also at the

beginning of this paper while showing how Bharata's N.S. implies the adaptation aspect of Aucitya. Says Rudraṭa:

अनुकरणभावमविकलमसमर्थादि स्वरूपतो गच्छन् ।
न भवति दुष्टमतादृक् विपरीतक्लिष्टवर्णं च ॥ VI., 47.

As an instance of all flaws becoming excellences, Namisādhu says that in describing a bad speaker committing mistakes of pronunciation, grammar etc., art makes Guṇas of all those mistakes. Aucitya or adaptation transforms Doṣas into Guṇas. He cites an instance of the funny description of the illiterate husband of the poetess Vikaṭanitambā who is unable to pronounce properly.

यथा विकटनितम्बायाः पतिमनुकुर्वाणा सखी ग्राह—

'काले माषं सस्ये मासं वदति शकाशं यश्च सकाशम् ।
उष्ट्रे लुम्पति रं वा षं वा तस्मै दत्ता विकटनितम्बा ॥'

इत्यादि ।

Following Rudraṭa, Bhoja says in the beginning of his treatment of those Doṣas which become Guṇas:—

पदाद्याश्रितदोषाणां ये चानुकरणादिषु ।
गुणत्वापत्तये नित्यं तेऽत्र दोषगुणाः स्मृताः॥ S. K. Ā. I., 89.

This point is realised by the American critic J. E. Spingarn who writes as follows as if explaining the principle of Aucitya, by which Doṣas become Guṇas as a result of circumstances like 'imitation' etc. Mr. Spingarn says, in an essay on the Seven Arts and the Seven Confusions, the very same thing, that in poetry and drama Doṣatva and Guṇatva are not absolutely fixed abstractly and that they are always relative. He remarks: 'It is inconceivable that a modern thinker should still adhere to the *abstract tests of good expression,* when it is obvious that we can only tell whether it is good or bad when we see it in its natural context. Is any word artistically bad in itself? Is not "ain't" an excellent expression when placed in the mouth of an illiterate character in a play or story?' In Rudraṭa's words, Spingarn says that a Grāmya word becomes most appropriate in a case

of Anukaraṇa—'imitation'. Therefore in expression, in the world of thought, in the realm of action and feeling, and in the region of ideas, that which is proper in the context, that which is useful to the Rasa, and that which has mutual harmony with the other parts, is the best and most beautiful.

In chapter XI, Rudraṭa again speaks of flaws of thought and emotion, Arthadoṣas and Rasadoṣas, where under 'Grāmya', he mentions Anaucitya or inappropriateness in doings, in port, in dress and in speech with reference to the country, family, caste, culture, wealth, age and position. The need for the Aucitya in these is emphasised by Bharata. Rudraṭa says:

ग्राम्यत्वमनौचित्यं व्यवहाराकारवेषवचनानां ।
देशकुलजातिविद्यावित्तवयस्स्थानपात्रेषु ॥ XI.,9.

All these Doṣas are again shown to become Guṇas in Śls. 18-23. We can illustrate this principle of Aucitya everywhere. Ordinarily Nyūnopamā or comparing to an inferior object and Adhikopamā or comparing to a superior object are flaws of Upamā or the figure of Simile but these two are the very secret of success when a poet wants to satirise a person. Nyūnopamā and Adhikopamā are freely employed in comic and satiric writings where they become very 'Ucita'.

Ānandavardhana

The idea of Aucitya and that word itself also explicitly occur often in the Dhvanyāloka, besides being implied in many places. As a matter of fact, Kṣemendra, the systematic exponent of Aucitya as the 'Life' of poetry, took his inspiration only from Ānandavardhana. Ānanda has laid down that the 'Soul' of poetry is Rasa or Rasadhvani.

काव्यस्यात्मा स एवार्थः तथा चादिकवेः पुरा ।
क्रौञ्चद्वन्द्वियोगोत्थः शोकः श्लोकत्वमागतः ॥ I., 5.

That Dhvani is the only artistic process by which Rasa, the 'Ātman', is portrayed by the poet and is got at by the Sahṛdaya and that everywhere things appeal most by being deftly concealed and suggested by suppression in a fabric of symbology, are the reasons why Ānanda posits Dhvani as

the 'Ātman' of poetry. That really Rasa or Rasdhvani is the 'Ātman' he expressly admits even in the first Uddyota (vide p. 28). The most essential thing in Rasa is Aucitya. That Vastu or ideas and Alaṅkāra or the artistic expression couched in figure and style are only the outer garment of Rasa, that they are subordinate and serviceable only to Rasa and that they have meaning only as such is the way in which Ānanda speaks of the Aucitya of Vastu and Alaṅkāra to Rasa. Firstly, Alaṅkāra by itself has no virtue. It has to be relevant, helpful to develop Rasa and never an overgrowth hindering or making hideous the poem. The term Alaṅkāra itself has meaning only then.

रसभावादितात्पर्यमाश्रित्य विनिवेशनं ।
अलङ्कृतीनां सर्वासामलङ्कारत्वसाधनम् ॥ III., 6.

The topic of Aucitya of Alaṅkāra giving the rules which alone secure the appropriate employing of Alaṅkāra is dealt with by Ānanda in Ud. II, Sls. 15-20, pp. 85-93. He first takes up the Śabdālaṅkāras and condemns the Yamakas written at a stretch in such tender situations like Vipralambha. The rationale of Ānanda's principles is this: whatever the poet writes must be suggestive of Rasa and everything has to be tested good or bad, relevant or irrelevant, beautiful or ugly, by applying this strict logic of their capacity to suggest or hinder Rasa. The main refrain of Ānanda here is that Alaṅkāra should be structural, organically emerging as the only way of expressing an emotion and it must never be a cool, cold and deliberate effort at decoration, necessitating the forgetting of Rasa and the taking of a special effort.

रसाक्षिप्ततया यस्य बन्धः शक्यक्रियो भवेत् ।
अपृथग्यत्ननिर्वर्त्यः सोऽलंकारो ध्वनौ मतः ॥ II., 17.

On p. 88, in Kārikās 19-20, he gives the poet five practical ways of using Alaṅkāra to advantage. On this section is based the section on Alaṅkāraucitya in Kṣemendra's Aucityavicāracarcā.

Similarly Ānanda relates Guṇa to Rasa of which Guṇa is the 'Dharma' and points out Aucitya of Guṇa. The

quality of Mādhurya is inherent in Śṛṅgāra, Vipralambha and Karuṇa whereas Raudra is attended by the quality of Dīpti, by a blazing up of the hearts. Accordingly words and collocation used in the two different cases must be such as to agree with the mood and the atmosphere of the Guṇa and its Rasa or such as to suggest the Guṇa and the Rasa. Thus sweet sound effects, the soft letters with nasal conjunct consonants suggest and promote the realisation of the tenderer and sweeter emotional moods whereas harsh combinations which jar in the above instances instil vigour and become very appropriate to or highly suggestive of the wild Rasa of Raudra. This proper use of letters is Varṇa-aucitya; Ānanda will say that there is Varṇadhvani in these instances; and a third will call it Varṇavakratā. Collocation suggestive of Rasa or appropriate to Rasa is a case of Dhvani from Saṅghaṭanā or Aucitya of Saṅghaṭanā. Both these instances of Aucitya of Varṇa and Saṅghaṭanā coming under Guṇaucitya are treated of by Ānanda in Ud. III.

यस्त्वलक्ष्यक्रमव्यङ्ग्यो ध्वनिर्वर्णपदादिषु ।
वाक्ये संघटनायां च स प्रबन्धेऽपि दीप्यते ॥ III., 2.

Wherever there is suggestiveness of Rasa in the expression, be it the element of sound and letter, separate words, collocation, portions of the theme (Prakaraṇa) or even the work as a whole, there we have the Aucitya of those elements to Rasa which is the main thing. This is the relation between Dhvani and Aucitya. This is the relation between Dhvani and Vakratā or Vakrokti, as Abhinava points out in his commentary on chap. XV of the Nāṭyaśāstra.[1]

Ānanda says of Varṇas :—

शषौ सरेफसंयोगौ ढकारश्चापि भूयसा ।
विरोधिनःस्युःशृङ्गारे तेन वर्णा रसच्युतः ॥
त एव तु निवेश्यन्ते बीभत्सादौ रसे यदा ।
तदा तं दीपयन्त्येव तेन वर्णाः रसच्युतः ॥ III., 3-4.

[1] *Vide* my article on the Writers quoted in the Abhinavabhāratī, *Journal of Oriental Research,* Madras, Vol. VI, Part III. p. 221. Abhinava reconciles here Dhvani, Vakratā and general Vaicitrya. We can reconcile Aucitya also to these.

Sounds must be appropriate—Ucita—enough to suggest the Rasa. This is the Aucitya called Appropriateness, the test of this Aucitya being the harmony between the expressed sounds and the suggested Rasa, the power of the former, the vehicle and the means, in suggesting the latter, the end. The same sounds helpful, suggestive, or appropriate in one case need not always be so. They are inappropriate to other cases where other suggestive means of expression are required. Similarly what is useless in one case becomes useful in another and this is the Aucitya called Adaptation.

Then Ānanda speaks of another kind of Guṇaucitya called the Saṅghaṭanaucitya.

गुणानाश्रित्य तिष्ठन्तो माधुर्यादीन् व्यनक्ति सा।
रसांस्तन्नियमं हेतुः औचित्यं वक्तृवाच्ययोः ॥ III., 6.

Viṣayaucitya is dealt with in III, 7 and Rasaucitya regarding Saṅghaṭanā in III, 9. This topic of Saṅghaṭanā as having its intelligibility in suggesting the qualities of Mādhurya and Ojas which in turn bring in their emotions, Vipralambha and Raudra and as being finally controlled by the Aucitya of Rasa, together with three other minor principles of Aucitya of Vaktā, (the character), Vācya (the subject) and Viṣaya, (the nature or form of artistic expression like the classification into drama, epic poem, campū, prose etc.)—is the special contribution of Ānanda for which he thus takes credit :

इति काव्यार्थविवेको योऽयं चेतश्चमत्कृतिविधायी।
सूरिभिरनुसृतसारैरस्मदुपज्ञो न विस्मार्यः ॥ III., p. 144.

Viṣayaucitya is pointed out by Bharata himself. The dramatic form as such enforces certain conditions and principles of Aucitya on the poet. Ānanda says that in a drama, the supreme concern of the poet shall be only Rasa. He shall never think of Alaṅkāra etc. In drama especially long compounds should be avoided.

'एवं च दीर्घसमासा संघटना .....तस्यां नात्यन्तमभिनिवेशः शोभते, विशेषतोऽभिनेयार्थे काव्ये ..... ।'

Dhva. Ā., p. 139.

All things impeding the quick realisation of Rasa must be avoided. According to Bharata this additional Aucitya must be observed as regards drama in particular: the words used must be simple, well-known and easy to be understood, delicate and sweet to hear. Harsh words and grammarisms like Yaṅglugantas, Cekrīḍita etc., in a drama are like anchorites with Kamaṇḍalus in a courtezan's room. They are 'Anucita' in drama.

चेक्रीडितादैः शब्दैस्तु काव्यबन्धा भवन्ति ये ।
वेश्या इव न शोभन्ते कमण्डलुधरैर्द्विजैः ॥
मृदुशब्दं सुखार्थं च कविः कुर्यात्तु नाटकम् ।

N. S. XXI., 131-2. (Vide also XVII.,121-3.)

तस्माद्गम्भीरार्थाः शब्दा ये लोकवेदसंसिद्धाः ।
सर्वजनेन ग्राह्याः संयोज्या नाटके विधिवत् ॥

N. S. XXVII., 46

The section on Prabandhadhvani deals with the very substance of a poem or drama and here one has to see that everything observes the principles of Aucitya and justifies itself by suggesting, as best as it can, the Rasa. A story has to be built as the expression of a Rasa. If a story already available is handled changes suitable to the Rasa must be made wherever the old story is not helpful to bring out the Rasa. If there are too many incidents, only those that are most expressive of the emotion must be chosen. This is Prabandhadhvani and Prabandhaucitya as also Prakaraṇadhvani and Prakaraṇaucitya to adopt the two-fold classification of Kuntaka. Bhoja would call this appropriate change in the story as Prabandhadoṣahāna and Kuntaka as Prakaraṇavakratā. Appropriateness of which suggestivenes is the touchstone is meant by all of them. Says Ānanda:—

विभावभावानुभावसञ्चार्यौचित्यचारुणः ।
विधिः कथाशरीरस्य वृत्तस्योत्प्रेक्षितस्य वा ॥

इतिवृत्तवशायातां त्यक्त्वाननुगुणां स्थितिं ।
उत्प्रेक्ष्योऽप्यन्तराभीष्टरसोचितकथोन्नयः ॥
सन्धिसन्ध्यङ्गघटनं रसाभिव्यक्त्यपेक्षया ।
न तु केवलशास्त्रार्थस्थितिसंपादनेच्छया ॥
उद्दीपनप्रशमने यथावसरमन्तरा ।
रसस्यारब्धविश्रान्तेरनुसन्धानमङ्गिनः ॥
अलङ्कृतीनां शक्तावप्यानुरूप्येण योजनं ।
प्रबन्धस्य रसादीनां व्यञ्जकत्वे निबन्धनम् ॥ III., 10-14.

The Aṅgas or subsidiary themes and accessory emotional interests have to be developed only up to the extent proper to them and their Aṅgin, *i.e.*, the chief theme and its Rasa. Thus the episodes, the Patākās and Prakarīs, in a drama or the 'descriptions' in a Mahākāvya have to observe the rule of Aucitya which is proportional harmony. They must not make one forget the main thread and sidetrack him for a sojourn into grounds foreign in purpose to the main theme. That is why Lollaṭa condemns the descriptive digressions in the Mahākāvyas and emphasises thereby the same principle of the Aucitya of proportion by demanding that everything must be 'Rasavat'. When this rule is not observed faults are committed. By the transgression of the principles laid down by Ānanda in the above-given verses and in other places also, Hemacandra, who follows Ānanda and of whose system he is a clear exponent, points out that the following literary flaws are committed :

1. अङ्गस्य अप्रधानस्य अतिविस्तरेण वर्णनं—यथा हयग्रीववधे हयग्रीवस्य । यथा वा विप्रलम्भशृङ्गारे नायकस्य कस्यचित् वर्णयितुमुपक्रान्ते कवेः यमकाद्यलङ्कारनिबन्धरसिकतया समुद्रादेः । K. A. III., p. 121

In Harivijaya, when the delicate sentiment of Vipralambha has to be delineated, the poet has succumbed to the temptation of an overdone description of the beach and the sea. Such irrelevancies can be characterised as so many swellings on the face of a Kāvya. Hemacandra does not spare even the

major poets while considering this aspect of Aucitya. He criticises both the prose works of Bāṇa and the Kāvyas like Śiśupālavadha for their 'Gaḍus'.

2. अङ्गिनः प्रधानस्य अननुसन्धानम्. Hemacandra remarks that though the drama has to be varied in interest and many other emotions have to be introduced as subsidiary features, the poet must not concentrate on the subsidiary Aṅgas and lose sight of the Aṅgin which must be taken up and brought to the forefront wherever necessary. The main thread must never be lost sight of; for as Hemacandra says:

'अनुसन्धिर्हि सर्वस्वं सहृदयतायाः ।'

3. Irrelevant description or introduction of events, incidents or ideas that have nothing to do with the Rasa is a great mistake. It is 'अनङ्गस्य रसानुपकारस्य वर्णनम् ।'. These are the principles of Aucitya which secure proportion and harmony. (Vide also Mammaṭa, K. Pra. VII., 13-14.)

The fourth Doṣa mentioned by Hemacandra is Prakṛtivyatyaya, breach of Prakṛtyaucitya of which Bharata has spoken at length and which we referred to in the opening section where we held that in this concept of Prakṛti, Bharata implicitly laid down the doctrine of Aucitya also. All these Doṣas are derived from Ānanda's Vṛtti on his own Kārikās on Prabandhadhvani which we have quoted above. In this section Ānanda speaks of the Aucitya of Vibhāva, Anubhāva and Sañcārin, all of which can be included in the one idea of Bhāvaucitya which resolves into a question of Prakṛtyaucitya. Aucitya is very often met with in this section in the III. Ud. of the Dhva. Ā. It is in this section that Ānandavardhana formulates that memorable verse which is the greatest exposition of the concept of Aucitya and its place in poetry. He says here: Nothing hinders Rasa as Anaucitya or improperiety; Aucitya is the great secret of Rasa.

अनौचित्यादृते नान्यत् रसभङ्गस्य कारणम् ।
प्रसिद्धौचित्यबन्धस्तु रसस्योपनिषत्परा ॥ III., 15.

Bharata himself recognises how each part and incident in the drama has to refer to Rasa and how, otherwise, it has no

right to exist. It is only natural, for Bharata is the writer who lays the greatest emphasis on Rasa to which everything else is subservient. Ānanda observes that, simply because Bharata has laid down a certain number of emotional points or incidents as Sandhyaṅgas, one must not try to see that he introduces everything mentioned by Bharata. Whatever is introduced must be on the score of its suggestiveness of Rasa and not on the score of loyalty to text.

सन्धिसन्ध्यङ्गघटनं रसाभिव्यक्त्यपेक्षया ।
न तु केवलशास्त्रार्थस्थितिसंपादनेच्छया ॥ III. 12. Dhva. Ā.

Bharata himself says so finally having given all the Sandhyaṅgas and Ānanda only restates the following of Bharata:

सर्वाङ्गाणि कदाचित्तु द्वित्रियोगेन (गो न) वा पुनः ।
ज्ञात्वा कार्यमवस्थां च योज्यान्यङ्गानि सन्धिषु ॥
N. S. XXI., 107.

Bharata emphasises discretion; 'ज्ञात्वा कार्यं अवस्थां च'; this suitability or writing according to the needs of the context is only the sense of Aucitya in a poet.

(To be continued)

MARRIAGE AMONG THE PRIMITIVE PEOPLE OF TRAVANCORE

BY

L. A. KRISHNA IYER, M.A.

Marriage, both in theory and practice, is in the melting pot. It has been built up on a system of human needs and conditions which have hitherto been static. 'There are everywhere three motives which lead to marriage, mutual sympathy, the desire for progeny, and the necessity for mutual aid in the struggle for existence'.[1] Primitive marriage was dictated by the inexorable population need. Travancore is one of the ideal places to study primitive marriage institutions. It is proposed to deal here with some aspects of the marriage customs among the Pre-Dravidian and Dravidian Castes and tribes after dealing with their habitat, occupation, and habitations.

Habitat.—The hilly part of Travancore is extensive and picturesque and covers an area of 2,500 square miles. It forms the abode of the hill-tribes. The Muduvan, the Mannan, the Paliyan, and Ūrāli are found in the High Ranges and Cardamom Hills over an elevation of 3,000 feet above sea level. They are healthy and are characterised by great lung capacity, massive chests, and large torsos, which are due to rarefied air in high elevation. The Malapulaya is found in the Anjanad valley below 2,000 feet. Along the base of the ghats are found scattered the Vishavan, the Malayarayan, the Ullādan, the Hill-Pandāram, the Malavēdan, and the Kānikār. The Hill-Pandārams form the only tribe least affected by civilization. The hill-tribes numbered 12,637 in 1921, indicating a fall of 3,136 from the Census of 1911. According to the latest returns, they number 2,907. Geographical conditions have condemned them to isolation in 'regions of poverty today and anxiety for the morrow'.

Occupation.—Climate dictates what kind of crops man may raise. The Mannans, the Muduvans, and the Paliyans

[1] Count Keyserling, *The Book of Marriage*, p. 54.

cultivate ragi, on an elevation of 2,000 to 5,000 feet; while the Kānikārs, the Malayarayans, the Ullādans and Vishavans cultivate paddy and tapioca in lower elevations. Where it encourages growth of forests it prolongs the hunter stage of development and retards advance to agriculture. This is true of the Hill-Pandārams who are in the hunting stage of civilization. Gregariousness among them would be a positive disadvantage. They live in families of 2 or 3 in a locality and move on to another when the food supply is exhausted. As Virgil would have it 'they knew neither how to garner their stores, nor to hoard the gathered grain'.[1] All the other hill-tribes are nomadic agriculturists.

Habitations.—The hill-tribes live in the regions of the bamboo and the reed which are used for a variety of purposes. The Hill-Pandārams live in rock shelters or break-winds, resting on junglewood posts and thatched with wild plantain leaves. The huts are larger and rectangular in shape among the Muduvans, the Mannans, the Ūrālis, and the Paliyans, but the floor is on a level with the ground. The floor is raised from the ground and the hut is of an improved pattern among the Malayarayans, the Ullādans and the Malapulayas. It is made of junglewood posts, reeds, and bamboo, and thatched with grass. Among the Ūrālis and the Malayarayans, there are tree-houses where they spend the night as they are living in high jungle. They are built high up on trees about 50 feet from the ground. Survival of pile-dwellings is seen among the Kānikārs.

Marriage.—Marriage is the joining together of a man and a woman. Before marriage the sexes are separated by sexual taboo. At marriage, they are joined together by the same ideas, worked down to their logical conclusion in reciprocity of relation. Those who were mutually taboo now break the taboo.[2] Speaking generally, 'marriage is the source of the family, the safeguard of private and public morals, the strength of the nation'.[3]

Cross cousin marriage.—Exogamy is found among all primitive peoples in the world and the division of a tribe into a number of exogamous clans is a well recognised phenomenon

[1] P. Vidal De La Blache, *The Principles of Human Geography*, p. 56.
[2] A. E. Crawley, *The Mystic Rose*, pp. 287–88.
[3] *Sex in Civilization*, p. 231.

in Travancore. A man marries the daughter of his mother's brother or father's sister. The children of two brothers or two sisters will belong to the same clan and will not therefore be able to intermarry. It is worthy of mention that cross-cousin marriage is absent among the Vishavans of Idyara Valley.

Monogamy.—Monogamy has had its human origin among the poor. Chastity in women has always been esteemed as a virtue by man, and monogamy has always been a desideratum. Most of the hill-tribes are monogamous, and the family is regarded as the corner-stone of society. Weddings generally take place at dusk of night among the Malayarayans, the Malapulayas, the Hill-Pandārams, the Paliyans, the Muduvans, and the Mannans. Sight is a method of contagion in primitive science, and the idea coincides with the physiological aversion to see dangerous things, and with sexual shyness and timidity. Dr. Westermarck's view is that this custom is due to a desire to protect the bride and bridegroom against dangers from above.[1]

Marriage ceremonies.—Besides the usual exchange of cloths and tying of *tāli* (marriage badge), the commonest of marriage ceremonies is eating and drinking together. The Karavazhi Pulaya bridegroom and bride sit on a mat facing east. Food is served on a leaf in front. The bridegroom gives a ball of rice to the bride. She in turn gives one to him which he eats. Among the Hill-Pandārams of Pathanapuram, the bride's father joins the right hand of the bride with the left hand of the bridegroom, and says 'I hand over my daughter to you. Take care of her'. The couple are seated on a mat when four balls of rice are brought in a leaf by the bridegroom's sister. The bride hands over two balls of rice to her husband who eats same. He then gives two balls of rice to his wife who eats same. This mutual inoculation by food is the strongest of all ties and breaks the most important of sexual taboos, that against eating together. Each gives the other part of himself and receives from the other part of him. This effects union by assimilating the one to the other, so as to produce somewhat of identity of substance. When the act is done, its sacramental character is

[1] Crawley, *The Mystic Rose*, p. 296.

intensified.[1] Again, the rudimentary ceremonies like joining of hands publicly have, according to Malinowski, some inherent force and an importance as sanctions. Here mutual contact fulfils the union. It is a ceremonial pre-representation of the actual union in marriage, assisting the union by making it safe and making it previously, and, as it were objectively.[2] Eating together is a common marriage custom prevalent in Fiji and other parts of the world.

Among the Kānikārs of Kottur, there is a slight variation of this custom. One of the modes of mutual contact is the pressing together of the heads of the pair. The couple are seated on a mat, and rice and curry are served on a plantain leaf. Then two women take hold of the bride's head and press it seven times against her husband's shoulders. This over, the bridegoom takes a small quantity of rice and curry and puts it seven times into the mouth of his wife. The Malayarayans have another interesting custom. After the usual exchange of cloths and tying of tāli, the couple are seated on a mat facing east. The bride's brother then gives her a betel leaf which she tears into two. She then changes hand and is then asked to give one half to her lover. She then chews one half. They are then asked to spit in the same spittoon. This consummates marriage. The chewing of betel by the couple constitutes the essence of marriage among the Minihasas of Celebes and the Balans. The pair then eat off from the same leaf.

The Muduvans have another interesting custom. Marriage takes place in the evening in the bride's hut, when the parents of the girl cannot be spectators of the ceremony. The bridegroom presents among other things a comb made of golden bamboo which forms the essential part of the ceremony. It is always worn by women above the knotted hair on the back. This custom prevails among the Mannans. The wearing of combs by women has a wide geographical distribution. It is found among the Australians, the Semangs of the Malay Peninsula, the Sakais of Perak, the Oraons of Chota Nagpur, and the Kadirs of the Cochin State. It is a remarkable phenomenon that the distribution of the comb follows the distribution of the bamboo.

[1] & [2] Crawley, *The Mystic Rose*, pp. 348-50.

Marriage by capture.—The custom of marriage by capture lingers among the Muduvans and the Mannans. When a woman's parents do not favour her marriage with a man who seeks her hand, the latter makes away with the woman to the jungle, and lives there for a few days in a secluded part. Meanwhile, they are being searched for and taken back to the village, where they are tried by the village panchayat, and let off with a fine. The marriage is then allowed to run its course. Elopement is another recognised institution among the Mannans and arises out of parental objection.

Polygamy.—'That man is by nature polygamous and woman monogamous is biologic rot and has no more sanction than the Divine right of kings, and will eventually go into the same discard'[1] says Dr. Dorsey. Polygamy marks the end of primitive equality and the appearance of clan distinctions. It develops in a society where private property is an institution. Polygamy is prevalent among the Muduvans, the Paliyans, the Kānikārs, the Malayarayans, the Malapulayas to a limited extent. It was widely prevalent among the Ūrālis among whom marriage is by exchange of sisters. Formerly, an Ūrāli married as many women as he had sisters. An Ūrāli cannot now purchase a wife from her parents by giving the equivalent in some kind of property. A man who has no sister to offer in marriage has often to lead a life of single blessedness. The result is unequal distribution of women as wives between the males of the community, the old man having more than the young, who had to go without any. Now polygamy is practised by them to a limited extent. Cross-cousin marriage is also in vogue. The custom of cross-cousin marriage is considered to have arisen from exchange of women by brothers. The system of marriage by exchange of sisters is also found among the Ullādans and Malavēdans of Travancore, the Madigas of Mysore, the Bhotiyas of United Provinces, the Garos of Assam, the Australians, and other backward races.

Polyandry.—According to Westermarck, polyandry depends a great deal on the proportion between male and female population and polygamy where women constitute the majority in countries unaffected by European civilization.

[1] G. A. Dorsey, *Why We Behave Like Human Beings*, p. 437.

There are more men than women among the Malapulayas, the Malayarayans, the Ūrālis, and the Paliyans. It is said that where food is abundant, females exceed males. Where food is scarce, males exceed females. This holds good among the above tribes, among whom there are more males than females owing to scarcity of food.

Polyandry is of two kinds, the matriarchal where the husands are not related, and the fraternal where they are brothers or cousins on the father's side. In the case of the former, the husbands are merely recognised as lovers and lose their privileges at the pleasure of the woman. The matriarchal type is found among the Karavazhi Pulayas, the Plateau-Muduvans, and the Mannans. Fraternal polyandry merges into monogamy by the steady growth of the rights of the elder brother. It now exists in a community where mother-kin is the rule. This form of polyandry is due to poverty and the desire to avoid large families owing to paucity of females. It prevails to some extent among the Malayarayans, the Ullādans, the Paliyans and the Ūrālis among the hill-tribes, and the Kaniyāns, the Izhavas, and the Chakkāla Nayars. Rev. Mateer observes that the Ūrālis practised polyandry like the Todas. It is now becoming extinct. Polyandry may be traced to various causes. It may serve to check the increase of population in regions where the number of mouths remain adapted to the number of acres. It keeps family property intact where the husbands are brothers. Poverty and paucity of women may be a combined cause of polyandry.

Levirite and sororate.—The custom of marriage with a deceased brother's wife is called levirite. The corresponding custom of marriage with a deceased wife's sister is called sororate. The two customs are found complementary among the Ūrālis, the Ullādans, and the Mannans, while levirite is alone practised by the Malayarayans and the Kānikārs. The Malavēdans practise neither levirite nor sororate. Dr. Frazer thinks that the two customs are traceable to a common source in a form of group marriage. Dr. Westermarck does not concur with this view.

Widow marriage.—Widow marriage is permitted among the hill-tribes of Travancore. Where widow marriage is allowed, the general rule is that the deceased husband's younger

brother takes her as his wife. This is true of the Kānikārs, the Muduvans, the Mannans and the Ullādans. Marriage with elder brother of deceased husband is found to exist among the Malapulayas and the Malayarayans.

Pre-marital communism.—It is maintained that if chastity originated with the growth of marital jealousy, it would affect only those who are married and that most of the tribes who are Dravidian or Mongolian allowed the utmost freedom prior to marriage between the sexes within the tribe. This view does not hold good with Travancore. All the aboriginal tribes prohibit pre-marital intercourse between the sexes. Among the Muduvans, the Mannans and the Kānikārs there are separate dormitories for the unmarried young men and women. There they spend the night under the surveillance of elderly persons.

Pre-puberty coition.—Pre-puberty coition is permitted among the Vishavans, the Kānikārs, and the Cheenganni-vēdans. Early intercourse is injurious to health, and according to Carr-Saunders, it is not difficult to understand in a general way how, if this is so, the reproductive functions will be adversely affected.

Adultery.—The chastity of a woman is highly valued. Any breach of chastity used to be very severely punished. Among the Kānikārs of Kulathupuzha it used to be the custom that, if a man committed adultery, his legs were tied up to the branch of a tree. Straw was spread over the ground and it was smoked. The man's body is swung to and fro and he was given 24 lashes. The woman was given 12 lashes. The Kānikārs of Kottur tie up 101 twigs of tamarind tree into one, and the adulterer is given one lash with it. It is considered equivalent to 101 lashes.

The Malapulayas tie up both the guilty man and woman to a Mullu-Murukku tree (*Erythrina stricta*) which is called Vambumaram. The hands were tied to the tree with fibre. Both are given 12 lashes with a twig of tamarind.

If a Paliyan committed incest, the offence was heard by the village council. The culprit was formerly punished with being kept under stocks (കടഞ്ഞാ) for a day. This is said to be now given up. Punishment now takes the form of a fine.

The culprits among the Malavēdans are beaten and are fined 10 fanams each. The offence is partaken by the panchyat of 16 men who restore the woman to her husband.

Speaking generally, adultery is looked upon with abhorrence. Divorce is freely had by man or woman for very trivial reasons like incompatability of temper, sterility, and others.

Influence of civilization on sexual matters.—Contact with higher culture has proved pernicious to the morality of primitive peoples. Irregular connections between the sexes have, on the whole, exhibited a tendency to increase with the progress of civilization, for it would seem, according to Heape, highly probable that the reproductive power of man has increased with civilization. In the words of Havelock Ellis, 'a man is a man to his thumbs, and a woman is a woman down to her little toes. A masculine body implies a masculine mind, and a feminine body carries even more significant implications'. The Mannans, the Paliyans, and the Malapulayas have become demoralised with contact with the planting community on the hills, while among the higher caste Dravidian population, new problems have now arisen. The proportion of unmarried people and the marriage age are known to have risen in recent times. One important cause of the decline in the marriage is the difficulty of supporting a family in modern society. Generally speaking, the average age of marriage is more advanced among the upper classes than in the lower ones. The increasing economic independence of women has begun to make itself felt. Lastly, the tastes of men and women have become widened, their desires multiplied, and new gratifications and pleasures have been supplied to them. The domestic life does not fill so large a place in life.

Great difference of age in marriage is fatal to close smypathy since similar objects and interests are associated with similar periods or life, and these with similar intensity of sexual desire.[1] Among primitive tribes, the difference in marriageable age does not tend to be greater in Travancore, because marriage is the *sine qua non* of their existence. The modern tendency to shorten the difference in marriage age is achieved by increase in marriage age for females to approximate to the male post-

[1] Westermarck, *History of Human Marriage*, p. 362.

ponement of marriage. A note of warning is struck 'Between the age of 15 and 25 are ten long years. During these years, the mate hunger impulse cannot be put to sleep or locked in a closet'.[1] The earlier years are the most fecund years and postponement of marriage reduces fecundity.

As I said above, domestic life does not fill so large a place in life. 'Until recently, it was a woman-made world we lived in. The mere male had to go outside the world to work off his surplus energy. The wife-mother was the centre of the home and it was to her interest to make it a real centre. It became a hive of industry and a swarm of children. Whatever glorified it magnified her importance. Within, she was supreme. In this woman-made world, men passed half their lives, the other half was spent in bringing home the bacon. Now women have their rights. In obtaining rights, she abdicated a throne. She no longer rules by divine right. The children that bless the home are turned over to the nurse, while mother presides at bridge, over committees to cleanse the slums. Result—males no longer naively accept matrimony or implicitly trust their wives. Females turn to matrimony if they have nowhere else to turn.[2] Dr. Tagore says 'It is not by coming out of the home that woman can gain her liberty. Her liberation can only be effected in a society where her true *shakti,* her *ananda,* is given the widest and highest scope for its activity.[3]

C. E. M. Joad, one of the greatest philosophers, says, 'Aspire only to those virtues familar to your sex and think it your greatest commendation not to be talked off among men for good or evil. The greatest woman, according to Pericles, is one of whom nobody has heard'. Keyserling regarded marriage as a duty and resents the thought that one should expect to get happiness outside it.[4]

[1] & [2] Dorsey, *Why We Behave Like Human Beings*, p. 445.
[3] Keyserling, *The Book of Marriage*; Rabindranath Tagore, *The Indian Ideal of Marriage*, p. 121.
[4] *Sex in Civilization*, p. 231.

UNIVERSITY NOTES

Regulations, Course of Studies and Examinations

The B.Sc. Honours Degree Examination Regulations were revised. Minor alterations in the Regulations governing the several examinations were also made. The revision of the Regulations governing all the examinations with a view to ensure uniformity in arrangement, is under consideration.

It has been resolved to institute a Degree in Veterinary Science in the University.

The question of the recognition of the examinations of other universities has been a subject of discussion. The Syndicate after considering all correspondence on the matter has resolved that :

1. The Entrance Examination of any Indian University be accepted as equivalent to the Marticulation Examination of the Madras University; and

2. Except in the case of admission to professional courses of study (where the Syndicate may dispense with a strict compliance with the conditions) applicants from other universities must have obtained a first or second class or 45 per cent of the total marks in their examinations for admission to courses of study in this University.

Convocations

Two Convocations were held during the half-year. The first Convocation held on the 3rd August 1933 had two sessions one in the morning, mainly for the graduates who took a second Degree and the other in the evening for the persons who took their first Degrees, and Doctorate Degrees and all those Degree holders who were recipients of prizes and medals. The other Convocation was held on the 7th December 1933. His Excellency the Chancellor presided over the afternoon session of the first Convocation held on the 3rd August, 1933, and the Vice-Chancellor presided over the other two Convocations.

The Rev. P. Carty, S.J., B.Sc., D.D. delivered the address to the Graduates of the year at the Convocation held in the afternoon of the 3rd August.

The total number of persons that took the several Degrees, Diplomas and Certificates at the Convocations was 2,448.

The following persons were declared qualified for the higher Degrees in Research noted below :

	Subject of Thesis
Doctor of Science	
Mr. A. Subba Rao, M.A., M.Sc. ...	'Investigations on the Spectra of Arsenic and Bromine.'
Mr. K. S. Krishnan, M.Sc., Hony. Secretary, Indian Association for the Cultivation of Science, and Professor, University of Calcutta.	'Magnetic Susceptibilities of Crystals in relation to Crystal Stricture.'
Mr. S. Kalyanaraman, M.A., L.T., Asst. Professor of Physics, Presidency College, Madras.	'An Acoustic Survey of some Auditoria in Madras'.
Doctor of Philosophy	
Mr. T. R. Chintamani, M. A., Senior Lecturer, Department of Sanskrit, University of Madras.	'A History of Purva Mimamsa Literature.'
Master of Oriental Learning	
Mr. A. M. Satakoparamanujachari, Vidvan, Tamil Pandit, Govt. College, Kumbakonam.	'A History of Early Cera Kings from Tamil Sangam works.'

Teachers and Research Departments of the University

Dr. M. O. Parthasarathi Ayyangar, Professor of Botany in the Presidency College, Madras, has been appointed Professor of Botany in the University and Director of the Botany Research Laboratory of he University in the grade of Professor. The Director's post was hitherto held honorarily by Dr. T. Ekambaram, Lecturer in Natural Science in the Teachers' College, Saidapet.

The Government asked for the loan of the services of Dr. P. J. Thomas, University Professor of Indian Economics to serve on the Expert Committee appointed to work on the Economic Survey of India and the University has lent his services.

Lectures

The following courses of Special Lectures were delivered during the period :—

Dr. Arnold A. Bake ... 3 lectures on 'Indian Music and Western Music'.

Samasthana Vidvan R. Raghava Ayyangar ... 6 lectures on 'Tamil Culture with special reference to Tholkappiam, Kural and the Sangma Literature.

The following lectures were delivered by the Teachers and Honorary Readers of the University :—

Lecturer	*No. of Lectures*	*Subject of Lecture*
Dr. P. J. Thomas, Professor of Indian Economics.	6	Planned Economy for India. (3 lectures have been delivered.)
Mr. K. A. Nilakanta Sastri, Professor of Indian History and Archæology.	6	Early Hindu Javanese History and Art.
Mr. V. R. Ramachandra Dikshitar, Lecturer in Indian History.	2	'The Matsya Purana'.
Dr. C. Kunhan Raja, Reader in Sanskrit.	6	The Conception of Heaven, and Final Release and the Paths thereto in the Vedic Literature. (2 lectures delivered.)
Dr. R. Vaidyanathaswami, Reader in Mathematics.	6	The Continum Point and the Wave-Corpuscle.
Mr. S. S. Suryanarayana Sastri, Reader in Indian Philosophy.	6	Saiva Siddhanta.
Mr. R. Gopala Ayyar, Director, Zoology Research Laboratory.	6	1. Modern Zoology and Human Progress. 2. A few Marine Biological Problems. 3. Cytoplasmic Inclusions.
Dr. M. Damodaran, Director, Biochemistry Research Laboratory.	6	The Chemical Constitution of the Proteins.
Honorary Readership Lectures		
Mr. V. K. Ayyappan Pillai, M.A., Professor of English, Presidency College, Madras.	4	Some Aspects of Old English Religious Poetry.
Mr. J. P. Manikkam, M.A., Professor of Physics, Madras Christian College, Madras.	4	Studies in Statistical Theories.
Mr. P. Sambamurti, B.A., B.L., Lecturer in Indian Music, Queen Mary's College, Madras.	4	South Indian Music of the Post-Tyagaraja Period.
Mr. George Kuriyan, B.A., B. L., B. Sc. (Lond.), Lecturer in Geography, University of Madras.	4	Advanced Map Projections.

Mr. K. M. Panikker, B.A. (Oxon.), Bar-at-Law, who was appointed Lecturer under the Sundaram Ayyar-Krishnaswami Ayyar

Endowment Lectures, delivered a course of six lectures on 'Inter-Statal Law—the Law affecting the relations of the Indian States with the British Crown'.

Mr. V. Rangacharya, M.A., Professor of Indian History in the Presidency College, Madras, who was appointed Lecturer under the Sir S. Subrahmanya Ayyar Endowment Lectures, delivered a course of two lectures early in December, on 'The Economic Life, Ideas and Reconstructions in Vedic Times'.

Publications

The following works were published during the half year :

Indian History Department

1. Some Aspects of Vayu Purana, by Mr. V. R. Ramachandra Dikshitar, Lecturer in Indian History.
2. Modi Manscripts of Tanjore, by Mr. R. S. Shelvanker, Research Student, Department of Indian History.

Department of Tamil.

1. The Chronology of the Early Tamils, by Mr. K. N. Sivaraja Pillai, Senior Lecturer in Tamil.
2. Paranar, by Mr. Venkatarajulu Reddiyar, Junior Lecturer in Tamil.

Kanarese Department

1. Abhidana Vastukosha } edited by Messrs. A. Venkata
2. Pushpadanta Purana } Rao and H. Sesha Ayyangar.

Malayalam Department

Subhadraharanam (Pana), edited by Mr. C. Achyuta Menon, Senior Lecturer in Malayalam.

Sanskrit Department

Unadi Sutras, Parts I and II by Mr. T. R. Chintamani, Senior Lecturer in Sanskrit.

Diwan Bahadur A. Ramaswami Mudaliar's Lectures on 'Indian Federation' delivered under the Rt. Hon. V. S. Srinivasa Sastri Endowment Lectures, were also published by the University.

It has been resolved to issue a separate number of the University journal containing articles in the Indian Vernaculars.

Endowments

The following Endowments were accepted by the Syndicate during the year :

1. *The Hemingway Memorial Scholarship* from the Secretary of the Hemingway Memorial Committee, Madras, for the

award of a scholarship in the name of Mr. F. R. Hemingway, I.C.S., formerly Registrar of Co-operative Societies, Madras, to a candidate who pursues the B. A. Degree course taking Group IV-B, Economics.

2. *The Bardswell Law Scholarship,*—from the Secretary of the Bardswell Law Scholarship Fund, Madura, for the award of a scholarship in the name of Mr. H. R. Bardswell, who was the District and Sessions Judge, Madura, to a Graduate who is a native of Madura or Ramnad District pursuing the Law course for the B.L. in a college.

3. Dr. A. C. Asirvada Nadar Memorial Prize,—from the Secretary, Dr. A. C. Asirvada Nadar Memorial Committee for the award of a Prize in Memory of Dr. A. C. Asirvada Nadar, to the student who qualifies in the Final M.B., B.S. Degree at the first appearance for the whole examination (Part II) and gets the highest number of marks in Gynæcology and Obstetrics.

4. Mr. G. A. Natesan Prize,—from the subscribers to the G. A. Natesan Sashtiabdaputi Fund, to found a prize to be awarded for proficiency in Music either in B.A., or in the Diploma in Music.

The Ramarayaningar Prize for encouragement of Telugu Publication was awarded to Mr. D. Lakshminarasimhan, M.A., L.T., for his essay in Telugu on 'Rural Economics of India with special reference to South India'.

The Sir William Wedderburn Prize for research in Chemistry was awarded to Mr. S. V. Ganapati, B.A., M.Sc.

The Gokhale Prize for original research in Economics was awarded to Mr. G. Gopal Rao, M.A.

Conferences and Congresses

The Syndicate has appointed the following persons to represent the University as delegates for the several Conferences and Congresses.

Diwan Bahadur Sir K. Ramunni Menon, Kt. Mr. W. Erlam Smith Rao Bahadur Dr. A. Lakshmanaswami Mudaliar.	The Third Quinquennial Indian Universities Conference to be held at Delhi.
Dr. C. Kunhan Raja. Mr. K. A. Nilakanta Sastri. Mr. S. S. Suryanarayana Sastri.	All-India Oriental Conference to be held at Baroda.
Mr. S. S. Suryanarayana Sastri ...	All-India Philosophical Congress.

Dr. P. J. Thomas	...	All-India Economic Conference, to be held at Annamalainagar.
Mr. S. R. Ranganathan	...	All-India Library Conference held at Calcutta.
Mr. S. Anavaratavinayakam Pillai Mr. K. N. Sivaraj Pillai. Mr. V. Venkatarajulu Reddiyar.	...	The Tamil-Lovers' Conference.
Mr. C. Achyuta Menon	...	Kerala Sahitya Parishat held at Calicut.
Mr. A. Venkata Rao. Mr. H. Sesha Ayyangar.		The Karnataka Sahitya Parishat.

REVIEWS

It is regretted that an error crept in the name of a well-known author whose book was reviewed in the last number of the Journal. Dr. M. N. Saha (not M. N. Shah) is the author of the book 'Six Lectures on Atomic Physics' (Patna University Lectures) reviewed by Mr. P. E. Subramaniam.

THE MAIN CURRENTS OF MARATHA HISTORY (Patna University Readership Lectures, 1926). By G. S. SARDESAI, B.A., published by the Patna University (1926): pp. viii and 190.

This series of lectures by Mr. Sardesai who has recently brought out a series of *Selections from the Peshwa Daftar,* under the auspices of the Government of Bombay, was intended to be a rapid survey over the whole course of Maratha history bringing out those salient points which have been established on evidence gathered in the last two decades and more, in Maharashtra by the labours of scholars like Ranade, Parasnis, Khare and the enthusiasts connected with the Bharat Itihasa Samshodhaka Mandal, Poona. According to the evidence accumulated, the Shivaji period has undergone an almost complete reconstruction; and in the early Peshwa period and the post-Panipat epoch, many conclusions hitherto accepted as final, have been recast; and more are being modified. With an enthusiasm that is justifiable in the circumstances, Mr. Sardesai, himself a prominent member of this group of workers, sees a harmonious blending of the genius of the Yadava and the Vijayanagar cultures in Shivaji; and also—what can be regarded as a matter on which there can be more than one opinion—that the great ideals of Shivaji continued to surge in Maratha minds right up to the close of the eighteenth century. He admits, of course, that the Maratha ideal had some evil effects and notes that it brought an inertness to bear on Shahu's policy for nearly 40 years and an egoism that could not long sustain itself and had to be propped up on artificial bases.

Mr. Sardesai devotes the second lecture to a survey of recent historical research in Maharashtra and urges, in this connection, a more effective utilisation of Persian accounts and the records of the British and other European powers that would serve as a corrective and supplement. He then elaborates the main features of Shivaji's conception of a Hindu empire and explains how it was catching and fired the hearts of the Sikhs, the Jats and

the Rajputs. The ideal later on became warped from its original shape, when the Peishwas looked to the north and other directions for expansion. The author sees in this expansion an interchange of ideas between Hindustan and the Deccan. It is obviously a pardonable overestimate on his part to compare Shahu with Queen Victoria and to see in him virtues which were but the reflection of the greatness of his Peishwas and generals. The third Peishwa is known to have been lacking in sagacity and length of vision when he allowed himself to be led by lieutenants into the climax of Panipat. The lecture on Mahadji Scindia and Nana Farnavis is the model of a comparative estimate of the qualities and achievements of two great contemporary figures. In his last lecture Mr. Sardesai goes into an analysis of the causes that brought about the downfall of the Marathas, in which an woeful lack of organisation and equipment in the army naturally occupies a very prominent place. The book affords some stimulating ideas and interpretations and should be a welcome addition to the literature in English on Maratha polity and history.

C. S. S.

HISTORY OF INDIA A.D. 150 to A.D. 350. By Mr. K. P. Jayaswal, M.A. Published by Motilal Banarsi Das, Lahore, 1933, pp. 282. Price Rs. 10.

Mr. K. P. Jayaswal's researches on Ancient Indian Polity have contributed very largely to the elucidation of many problems of constitutional and administrative importance in Hindu India. Now he has come out with a History of India A.D. 150-350, generally known as the dark period of Indian History, and has thus supplied one of the missing links in the chain. The sources of information have been handled with caution and the evidences cited have a basis in fact. Hence the paramount importance of the book cannot be contested.

According to the author the ancient Nāgas continued to rule from A.D. 150 to 284 under the name of Bhāraśivas who drove out the Kuṣāns from Magadha and established what may be called a Democratic Empire. The Vākāṭakas, the Vindhyakas of the Purāṇas, established their kingdom by A.D. 284, which expanded into an empire and flourished until A.D. 348 when Samudragupta conquered them. Though their imperial position was shaken, yet they continued to reign as the feudatories of the Guptas.

The history of Magadha is traced from the fall of the Kaṇvas in 31 B.C., when the Sātavāhanas occupy Pāṭaliputra. During their preoccupation with Kadphises and Wema Kadphises, the

Lichchavis take possession of Magadha. About A.D. 200 the dynasty of the Kotas comes to power and continues until A.D. 275 when the first Gupta ruler appears as a feudatory. In the same way the history of South India pertaining to the relevant period is traced concisely but perspicuously. The never-ending controversy of the Pallava origin is set at rest by making them a junior branch of the Vākāṭakas. Incidentally the relations of South India with Farther India are examined. After summarising the achievements of Samudragupta, the author justly concludes that he did not overdo militarism, but gained his object through diplomacy and peace. One of the effects of the Gupta imperialism was the creation of an elevated national outlook from many points of view—political, social and cultural. Samudragupta was able to achieve all this because the spade-work had already been done by the Bhāraśivas and the Vākāṭakas. The book is an original thesis throwing definite light on an important period of Indian History.

V. R. R. DIKSHITAR.

THE REPORT OF THE EXECUTIVE COUNCIL OF THE UNIVERSITIES BUREAU OF THE BRITISH EMPIRE, for the year 1932-33, (London, 1933).

This report contains an illuminating account of the activities of the Bureau. Fifty universities are now associated with this bureau. The Indian Universities are represented on the Executive Committee by the Hon. Justice Mirza Ali Akbar Khan, Sir. B. N. Mitra, and Sir S. Radhakrishnan. The Bureau publishes a Year Book giving useful information about the Universities of the Empire.

ACKNOWLEDGMENTS

BOOKS

1. *The Making of the State* by M. Ruthnaswamy, M.A. London: Williams and Norgate, Ltd. 21*s*.
2. *The New Indian Constitution* by A. Krishnaswamy, London: Williams and Norgate, Ltd.

*3. *The Main Currents of Maratha History*—by G. S. Sardesai, B.A. (Patna University).

*4. *The History of India* A.D. 150 to A.D. 350. By K. P. Jayaswal, M.A. Published by Motilal Banarsi Das, Lahore.

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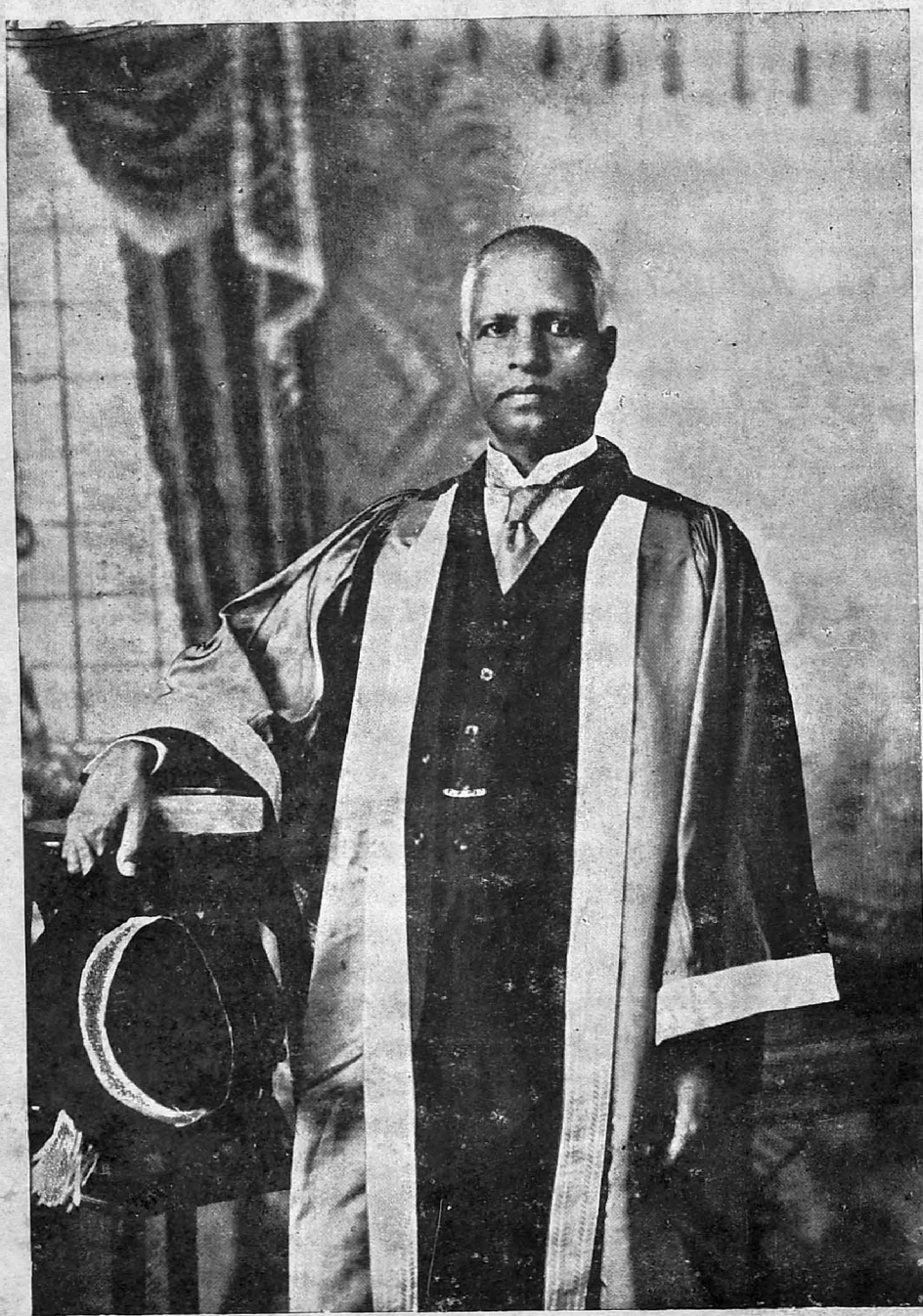

[*See p. 277.*

SIR K. RAMUNNI MENON, *Kt.*

THE CHIEF PREVENTIBLE BLINDING DISEASES OF CHILDHOOD

Dr. Elizabeth Matthai Lectures 1933-34 (Madras University).

BY

Lt.-Col. R. E. WRIGHT, C.I.E., I.M.S.

Professor of Ophthalmology, Medical College and Superintendent, Govt. Ophthalmic Hospital, Madras.

(Member, International Association for the Prevention of Blindness, and Member, International Council of Ophthalmology)

The first of the series of three lectures on " The chief preventible blinding diseases of childhood " was delivered in the theatre of the Elliot School of Ophthalmology, Govt. Ophthalmic Hospital, Egmore, Madras, on the evening of Tuesday the 6th March 1934. The subject of the first lecture being ' Deficiency disease and Trachoma.'

In introducing the lecturer, the Surgeon-General, Sir Frank Connor, made some interesting remarks regarding the history of the Madras Eye Infirmary now named the Govt. Ophthalmic Hospital. He said: The first eye hospital in the English-speaking world was founded by Saunders in London in 1805. From this parent institution, now known throughout the world as " The Moorfield's Eye Hospital ' the following eye infirmaries were founded :

Exeter	Eye Infirmary	Adams	1807
Madras	,, ,,	Richardson	1819
New York	Eye and Ear Infirmary	Delafield and Rogers	1820
Calcutta	Eye Infirmary	Egerton	1824
Bombay	,, ,,	Jeafferson	1824
Boston	Massachusetts Eye and Ear Infirmary	Reynolds	1824

He showed photographs of some of these pioneers of Ophthalmology.

LECTURE I

DEFICIENCY DISEASE AND TRACHOMA

The deficiency disease which is so largely responsible for preventible blindness in children in the Madras Presidency, as

also in the greater part of India and other parts of the world, notably China, is the avitaminosis, known as keratomalacia.

Let us briefly consider some of the clinical features of keratomalacia with which most of you, lay and medical, are probably familiar. Its earliest manifestation is a symptom, night blindness, which is therefore not observed in the class of cases we are considering, namely, the young child. It is however the complaint which brings many older children and adolescents to the hospital. The next evidence of this progressive deficiency is the peculiar smokiness of the conjunctiva (illustrated at the lecture by paintings and actual cases). This is the earliest obvious sign just as the night blindness is the earliest symptom. One may meet either or both of these in a youth who is apparently healthy-looking in other respects. They are however danger signals and if it were possible for the baby to complain of the first, or for the mother to detect the second, the advance of the condition to a serious stage might be averted. When the early signs and symptoms appear, if nothing is done to augment the amount of essential food factors in the diet, the case rapidly progresses and marasmus sets in; the patient becomes wasted, the skin harsh and earthy-looking, the hair appears dull brittle and thin, the mucous membranes also show a diminished secretion and the more accessible membranes of the nose, mouth and throat are seen to be abnormally dry. It is generally somewhere about this stage that we have babies brought to the out-patients department. *Pari passu* with the wasting of the mucous membranes, there is an advance in the eye symptoms. As a rule the smoky conjunctiva becomes dry, wrinkled and greasy-looking, the cornea becomes dull and lustreless, and eventually opaque. Occasionally the changes in the eye are of a different type and instead of a dry greasiness, we find a wet, dull, red conjunctiva. In the one case there appears to be a suppression of the lachrymal secretion ; in the second it is excessive, but this does not obscure the essential changes. Little patches covered with a sort of white foam appear on the conjunctiva,—Bitot's spots—, they are generally situated at either end of the horizontal diameter of the cornea. The cornea eventually undergoes necrosis and ulceration and if untreated, the ulcer perforates, and the eye is ultimately lost. Should the condition be improved at the stage when both corneæ present large ulcers, the child may be restored to good

general health, but remains blind on account of the dense scar tissue opacities (leucomata) of the corneæ. Certain of these children who show gross ulceration heal with the formation of thin, weak scars of the corneæ. Such cases may present themselves some years later with well-marked bulging (staphylomata) of the corneæ. If seen in this state for the first time it would be impossible to tell whether these staphylomata resulted from keratomalacia or other forms of ulceration in early childhood.

It is sometimes quite impossible for the mother to observe the condition of the baby's eyes when she brings the child to the hospital, as, by the time she has made up her mind to seek relief it requires an expert to open the lids and examine the state of the cornea ; but she has probably noted previously that there was something definitely wrong with the eyes and the progressive wasting of the infant drives her to seek relief. By the time the average mother brings the baby to the hospital, the skin is hanging in baggy wrinkles round the joints,—the so-called elephant skin,—the mucous membranes of the mouth nose and throat are wasted glazed and dry, the thin piping or hoarse croaking voice is hardly recognisable as proceeding from a human being. The alimentary tract is affected just as the mucous membrane of the respiratory tract, and diarrhœa of one type or another is present. When this condition of marasmus is reached, the child is, as a rule, blind, but in spite of the appalling general state, it is a relatively easy matter to restore it to comparative health again with cod liver oil. Even if the child is too ill to take cod liver oil by the mouth or to tolerate it in the intestinal tract, it is often possible to save the life of the child by wrapping it in a flannel binder soaked in cod liver oil. We are not here concerned with the general condition or even the tissue changes in the various mucous membranes. What we are considering is the state of the eyes, and, by the time numbers of babies reach our out-patient department, either one or both the eyes have been so damaged as to result in partial or complete blindness, even though health is restored. This is perhaps all that is necessary to say about the clinical aspect of the condition.

The degenerative condition thus designated is due in the main to a deficiency of vitamin A in the diet ; vitamins B, C and D are possibly also concerned so that one may perhaps regard it as a polydeficiency, but we need not now discuss what part these latter

food factors play. The signs and symptoms observed in human beings who are suffering from keratomalacia are similar to those artificially produced in animals by withholding vitamin A from the diet, referred to by experimentalists as xerophthalmia. The clinical evidences of keratomalacia have probably been known for thousands of years although it is only recently that scientific research has enabled us to place the condition amongst the avitaminoses.

The treatment of certain affections of the eye by the same methods as are in use today for keratomalacia was known to the ancients. The fact that liver was used successfully in treating night blindness in ancient Egypt, Greece, parts of India, Russia, Japan, and elsewhere, strongly suggests that it was keratomalacia, of which night blindness is such a prominent symptom,—which was dealt with. If, for example, the treatment by means of roasted ox liver, recorded in the 'Book of the Eyes' of the Egyptian Papyrus of 1500 B.C. deciphered by Ebers in 1872, was for night blindness, —and this is likely in view of subsequent ophthalmological history—then it is not improbable that this treatment was for the night blindness of avitaminosis. A reference to the literature bearing on this subject shows that liver administration in various ways was handed down from generation to generation in many countries as a treatment for night blindness. It is unlikely that this would be so if the treatment was not relatively successful. There are records which show that such night blindness sometimes followed fasts and famine, was sometimes associated with xerosis, and sometimes went on to complete blindness, which sequence is true of keratomalacia. To those who have lived in keratomalacia-ridden countries, the old records indicate that the night blindness of retinitis pigmentosa and congenital stationary night blindness, which are permanent and not influenced by treatment, cannot have been the sole causes of the night blindness which determined a worldwide belief in a treatment which has been handed down to the present day, and which we now find in use in remote districts hardly touched by western medicine, as a specific for the condition we call keratomalacia. We may therefore argue, I think, that there is strong probable evidence in favour of the view that successfully treated cases included a high percentage of keratomalacia patients. Other varieties of temporary night blindness hardly enter into the picture, they are not even now

taken seriously by people who live in a primitive way unless some of the other evidences of avitaminosis make their appearance.

This degenerative condition which we recognise as due to a deficiency in essential food factors and treat with cod liver oil, and which the ancients recognised in part and treated with liver in various forms, is a disease complex characterised by a march of symptoms and signs, which in an advanced state includes a partial necrosis of the corneal tissues with softening, sloughing, ulceration, and resultant blindness; hence the name keratomalacia.

If untreated, death frequently affords a merciful release and indeed the deaths registered as due to malnutrition marasmus, and diarrhœa, very frequently record the terminations of the lives of infants, blind of that eye affection which is such a prominent feature of this deficiency in food factors essential not only to the nutrition of the eye but to the very existence of the organism. When one compares the records of the causes of preventible blindness in children in western countries and in the east, it is noteworthy that keratomalacia plays an insignificant role in the former. Its great importance in India was however pointed out in a paper which I published in the *Lancet* of April 11, 1931. In that paper it is stated that keratomalacia is almost certainly the chief cause of preventible blindness in children in India. I stressed the words 'almost certainly' and am now glad that I did so, as at that time we did not consider that the hereditary blinding diseases should be included in our survey, but as will be pointed out in the third lecture of this series, I am prepared today to include this group, which is of enormous importance and interest.

Another point may be noted here which goes to show that the responsibility of keratomalacia as a blinding disease may have been underestimated in so far as the publication quoted above is concerned. In the year's survey of cases attending this hospital on which the figures quoted were based, there were about 30 children totally blinded, and 35 more in which practical blindness resulted. But these figures did not include a number of cases in the same year which are recorded as leucoma or staphyloma of the cornea and which were partially or totally blind from this cause. It is not possible to estimate with any degree of accuracy the frequency of the various causes of leucoma and staphyloma of the cornea, but we know that the common causes

are keratomalacia, small pox, the application of irritant remedies, and the ulcerations associated with acute and chronic diseases of the conjunctiva and cornea other than these. We may therefore include a certain proportion of the cases recorded as blind from leucoma and staphyloma in the kerotomalacia group. This would bring the figure of total and practical blindness (and by this one means partial blindness of such a degree as to seriously interfere with earning a livelihood), due to keratomalacia for that particular year to between 70 and 75 out of approximately 20,000 patients seen in this period. Approximately three per thousand of our hospital cases. We shall see later that the collective group of blinding hereditary diseases sometimes equals, but more often exceeds this figure. You must be content with this idea of frequency as I cannot give figures for the general population, or what percentage of the total blind at all ages is due to keratomalacia. Figures in this connection want the most careful analysis if they are not to lead us astray. For example one finds in a pamphlet on "Prevention of blindness," by a very eminent official, that the census return for blind in India is half a million, but his investigation makes it two millions. A statistician would almost certainly consider the Special Census Officer's figures to be more nearly correct than those of an individual founded at best on a selected and localised survey. We all feel at times that there are more blind in India than the Census return would indicate, but we are not entitled to found a generalised statement on very limited observation which a Special Census Officer could readily repudiate on statistical grounds. The population of the Madras Presidency was 47,193,602 and the number of blind 52,279 (1931 census); the population of England and Wales was 39,290,000 and the number of blind 46,822 (1927 census). These figures are given as a matter of interest as in these lectures we are not considering the total blind at all ages.

With regard to the treatment of the condition by cod liver oil, we have carried out a considerable amount of experimental work in this hospital for the last 12 years and tried numerous substitutes for cod liver oil,—some of which were more palatable—, but have not however found anything so efficient as crude cod liver oil. It is not necessary to administer it in large quantities. We have gradually reduced our dosage until now the average daily quantity of cod liver oil, administered in the form of

emulsion,—for small children is 7½ minims. Of course this does not apply in case the child is unable to take cod liver oil by the mouth. Irradiated ergosterol did not appear to have any better results than cod liver oil, nor did fresh liver, liver powder, etc. It would appear from our former work in this connection that vitamin A alone is not so effective in the treatment of the condition as when supplied in conjunction with other vitamins in the form of crude cod liver oil. One hears a great deal about the anti-infective nature of vitamin A, and apparently many experimentists regard the condition they produce by withholding vitamin A from the diet as productive of a condition in which the organism is more liable to invasion with pathogenic bacteriæ. As I have explained elsewhere there is no suggestion of this in clinical keratomalacia. I imagine that most of the experimentists have little experience of keratomalacia in bulk as we have. Far from there being any suggestion of an increased liability to organismal invasion the response of the body of an infant almost dead of this deficiency to treatment with cod liver oil contradicts the idea that organismal invasion holds sway. As the alimentary tract may be affected very severely by the bacteria which habitually attack this area, it is sometimes suggested that keratomalacia may follow on dysentery. This seems in our view a mistaken idea and we consider it is the converse which is true, that bacillary dysentery may attack the individual more readily when the tissues are damaged by avitaminosis. With this possible exception there is no evidence that the sufferer from avitaminosis is more liable to invasion by pathogens than other delicate children. The pathogens which have already settled in the conjunctiva, cornea, nasal mucosa, throat, lungs, and intestinal tract no doubt diminish as the patient improves on cod liver oil, but these pathogens have for weeks perhaps been leading a saprophytic existence in the very situations where they might have been expected to cause destruction of the individual earlier had they exercised their specific role, e.g., pneumococci in the respiratory tract.

Prevention.—As suggested in the title of these lectures, this is a preventible disease; it is also an easily treated disease. In spite of this it is probably responsible for more blindness in young children in India than any other single condition. Why then should it not be prevented? Simply because the economic

conditions do not permit. The question of prevention of keratomalacia and the blindness due to keratomalacia primarily concerns medical men to the extent of elucidating the nature of the blindness, the cause and treatment of the disease, and the method of its prevention. Having pointed this out to the community at large and the administration responsible for the public health, they cannot do more than relieve the limited number of cases which come their way, instruct others in methods of relief and so try to avoid individual suffering. The disease will gradually become eliminated as better conditions of life become established.

Trachoma

I have linked trachoma with deficiency disease more for convenience in spacing the subject-matter of these lectures than anything else. It shares with the latter the distinction of having been well-known to the ancients, but unfortunately hundreds of years of study by the medical profession has not thrown much light on the ætiology or treatment of this affection.

Trachoma is a chronic inflammatory affection of the conjunctiva which sometimes appears to follow an acute onset, but frequently sets in insidiously. Its clinical evidences in the early stages are unrecognisable with certainty. All the vaunted criteria for recognising this affection in its beginnings fail again and again so that I personally do not feel justified in teaching students or post-graduates to do anything more than record that a suspicious case is 'trachoma-like.' This, to my mind, is a safer procedure than labelling a doubtful case trachoma and subjecting the patient to some of the appalling forms of treatment recommended for this disease which may do such damage in a non-trachomatous affection as to produce changes in the tissue which may well be mistaken for the latter stages of the disease itself; if indeed the disease has not been grafted on to the individual during numerous attendances with other sufferers at some overcrowded dispensary. Another diagnosis which, in my opinion, should never be made is that of 'granular lids.' It is a method of hedging adopted by some members of the profession when uncertain as to what conjunctival condition they are dealing with. This pseudo-diagnosis gives a sort of moral support which enables the doctor to proceed at once with methods of treatment

which are calculated to transform a relatively simple affection into a condition of misery for the patient. The general public has a sort of horror of 'granular lids,' whatever that term may mean, and patients are contented to suffer much at the doctor's hands when so diagnosed. I regret to see that the term is still used in anti-trachoma propaganda literature by a distinguished medical pamphleteer. One of the most frequent errors in this connection is mistaking trachoma for that form of chronic conjunctival irritation associated with inspissation of the contents of the solitary glands of the mucous membrane, in which small yellowish seedlike elevations of the conjunctiva make their appearance ; But one need not particularise ; practically every variety of conjunctivitis has been labelled granular lids at one time or another and treated for trachoma.

Ætiology.—An enormous amount of work has been done, and is still being done in connection with the determination of the cause of this disease. There are distinguished ophthalmologists who consider that they can recognise the disease even in its earliest stages by the appearances of the tissues under the microscope ; others who believe it is due to a specific micro-organism which they can isolate, but many who remain sceptical as to the possibility of early diagnosis. I must confess to belonging to the latter class. Some years ago the distinguished Rockefeller bacteriologist, Noguchi, felt certain that he had isolated the organismal agent of trachoma. His B. granulosis isolated (in pure culture) from trachomatous Red Indians, produced a conjunctival condition in chimpanzees very similar to the earlier stages of trachoma in man. In 1927 I was privileged to examine some of Noguchi's chimpanzees and felt sanguine that at last the causative agent had been discovered ; for although the clinical evidences in these animals did not include the later stages,—the absolutely certain stages,—of humans, one felt that this might be due to a difference in soil. Laborious work since then all over the world has failed to confirm Noguchi's conception. In Madras, we failed to transmit the disease to animals although with the co-operation of Col. Cunningham, at the King Institute, Guindy, we were enabled to undertake numerous animal experiments.

You may ask, 'but how do you know you are dealing with a pure trachoma case when doing experimental transmission experiments?' We do not know, and this element of uncertainty

amongst observers as to what constitutes true trachoma makes investigation difficult. Experienced observers do not agree amongst themselves as to the diagnosis of the early stages of the disease and the very late stages are so complicated by other factors as to make ætiological investigation well nigh impossible. Differences of opinion also make statistics inaccurate and the classification of clinical stages almost hopeless. It almost makes one blush for shame to pick up a modern review of the current work on trachoma. No fair-minded reader can assume anything but that the most hopeless confusion exists in various parts of the world in the fields of histopathology, bacteriology, clinical signs and most of all, treatment.

Of course there are clinical pictures about which nearly all experienced observers would agree as to a diagnosis of trachoma even before the advanced stages. In such cases it is possible to so treat the conjunctiva (by washing) as to free it from all detectable organisms. Thereafter if some of the affected tissue is removed, and transferred to the healthy conjunctiva of man or animals, one might reasonably expect to reproduce the disease, because long experience has led us to believe firmly that the condition is contagious. Certain well-known ophthalmologists, careful observers, have recorded that they developed trachoma from a splash of infective material. It is said that the incubation period is relatively short—under a fortnight. Still experience supports the view that under good hygienic conditions the affection is contagious with difficulty. It is of course quite likely that in this conjunctivitis complex we are dealing with more than one affection, and that in the late stages of one or other of these conditions the picture is complicated by still other infections. In 1932 we tried to find out something about the infectivity of the disease. A case was selected in this hospital in which a number of observers agreed that trachoma was well established, but not too far advanced. With due bacteriological precautions, material was transferred from the patient's conjunctiva to that of a blind volunteer in which the conjunctiva was normal. Six days afterwards the patient developed what might well have been the early evidences of trachoma in the eye which had received the implantation. Three days later material collected from this eye failed to give a culture of B granulosis when examined at the King Institute, Guindy. Nine days after the first eye showed

signs, the second eye became infected. At no time subsequently did gross changes appear in the cornea of either eye, (although microscopic vascularisation was observed), which would justify a diagnosis of trachoma. The eye remained in what one might term a 'trachoma-like' condition for a while and then spontaneous improvement took place till in six weeks the patient was apparently normal again. A year later his conjunctivæ were normal. The case is an isolated one and therefore of no real scientific value, but it shows that even a deliberate implantation is not necessarily successful in reproducing this disease under favourable experimental conditions, whilst it is apparently readily transmitted from man to man in almost epidemic form under other conditions e.g., old time warfare. There is no doubt that there are many factors which influence the spread of this disease, the relative importance of which it is impossible to estimate. If we assume an infective agent, either a filter passing virus or a microscopic culturable organism, we must admit that its conditions of spread are peculiar. A world distribution map of the disease showing approximate percentages of population affected gives you some idea as to its prevalence. It is a rough guide to the possible association with race, religion, social conditions, food supply, density of population, humidity, temperature, elevation, general health etc. In so far as we are concerned in India it would appear to be a disease more of Mohammedans than Hindus; in South Indian Hindus it is more common in Brahmins. In my experience of Mohammedans it appears to be commoner in women; the same view is shared by certain competent observers in the north. Col. Kirwan, Professor of Ophthalmology, Calcutta advises me that it is relatively uncommon amongst Bengalis. The percentages of trachoma amongst the total eye cases treated in several widely scattered ophthalmic teaching centres furnished to me are approximately :—

Lucknow (United Provinces)	...	24% (treated for trachoma) Of the other eye cases seen between 20 to 30% also have trachoma.
Lahore (Punjab) ...	...	50%.
Bombay (Bombay presidency)	...	14·5%.
Madras (Madras presidency)	...	3·5%.

Rangoon (Burma) ... ... 75%. (I cannot but feel that this figure is greatly in excess of the frequency of trachoma in Burma where I visited practically every important station.)

I must here thank Professors N. M. Dick, J. N. Duggan and B. G. S. Acharya for their communication regarding blinding diseases in their areas of work.

It is associated with overcrowding, indoor living, dark, confined unventilated housing, and the purdah, rather than with poverty *per se*. It is more frequent in urban than rural populations. It is not necessarily a disease of hot countries; it is about as common in the cold, wet, dark slums of Dublin as in hot, humid, poverty-stricken areas of Madras. It appears to be more common in Indian groups who habitually drape the head and face with clothing. It is of interest to observe here that in some parts of India where there is no real cold season the disease is not so prevalent. In such localities the poor rural inhabitants are of cleaner habits; they go practically naked instead of wearing layers of dirty clothing, they lose no opportunity of getting into water and washing, although unfortunately for many of our South Indian people the water may be green and putrid, and contaminated with the causative agents of all manner of bowel infections and infestations. You are all familiar with its frequency in Mongols and Jews; possibly race has a determining influence, we do not know. There are many points in common however between the wretched conditions of life in the lowest strata of society in China, Palestine, the Slav countries and Egypt. It is not a disease of the better classes of Anglo-Saxons even though exposed again and again. It is a disease of the great unwashed, who fug in frouzy overcrowded dwellings, at least these types and conditions appear to mark reservoirs of the affection.

For purposes of these lectures trachoma does not concern us in India to the same extent as some of the other affections dealt with, as its blinding effect in small children under school age is relatively small. It is more a disease of adolescence and middle life and it is in the later age groups that it produces its main effects on the total blind rate. Still we must regard it as

one of the responsible causes of preventable blindness in young people. We may now ask ourselves, is it preventable, and if so, what are we doing to prevent it in India. The answer to the first question is 'yes,' the answer to the second, 'nothing of any consequence.'

The difficulties of prevention in a country like India would be enormous and uneconomical. The chief methods of prevention are inspection with segregation, and control of immigration. However feasible such measures may be in islands like Great Britain and Japan, or in a concentrated but strictly controlled population, e.g., the armies in the great war,—they are out of the question here where the frontiers (N.W., N. and N.E.) are uncontrollable. Pending a sound knowledge of the cause of the disease, the conditions which favour its spread, and a State preventive policy based on these, we, Government medical servants, play at prevention here and there and from time to time, by means of propaganda through the medical and educational departments, leaflets and posters, lectures, inspections of school children, etc.; similar activities are carried on in a tentative way over localised areas by the Blind Relief Association (Bombay), the Junior Red Cross and other similar organisations. Mysore is perhaps most progressive. Dr. B. K. Narayana Rao, Professor of Ophthalmology, Minto Ophthalmic Hospital, Bangalore, advises me that compulsory medical inspection of all students in all grades of education is legislated for, together with adequate arrangements for the treatment of cases in suitable centres, and financial help to the needy and deserving for the purpose.

Relief is carried on meantime. The organisations dealing with treatment are the thousands of hospitals and dispensaries maintained by the various local Governments and Native States and a few unofficial organisations such as the Blind Relief Association (Bombay). Such treatment, however humanely intended, can hardly affect to any appreciable degree the total amount of damage to the eyes due to this disease. I will not discuss treatment except to say that our experience goes to show that unless an efficient follow-up system is established, cases which have been brought to a stage of practical cure, relapse when they are lost sight of. One of the most general and effective forms of treatment is by means of the application of copper sulphate; it is of interest to note that it is one of the ancient

methods of attempting to cure this disease. Trachoma is one of those unfortunate diseases which the patient only gets once, as it is never absolutely cured as far as we know even though a practical cure may be effected. In January I was asked by the Chairman of the International Association for the Prevention of Blindness to attend their meeting in Paris in May, and also the meeting of the International Organisation against trachoma held simultaneously, and to send a brief report summarising the public health and administrative measures adopted in India versus trachoma. I regret that I am unable to attend the meeting but the report is a very easy matter and may be summarised in one word 'nothing', except as stated above, school legislation in Mysore.

It will be seen from the foregoing that the position with regard to trachoma is very unsatisfactory in India. The Government organisations and the voluntary organisations practise relief in the form of treatment. At school-going age, when the disease first becomes a serious problem, we find the beginnings of an attempt to stir up an interest in the affection in the sporadic reports of inspecting medical officers and others and the activities of the Junior Red Cross Society, but for all practical purposes the matter ends there. The diagnosis is uncertain and the statistics inaccurate, but nevertheless it appears to be one of the most serious menaces to adult sight in certain areas, notably the Punjab and the United Provinces. It is perhaps as well at the present time that large amounts of money should not be diverted to doubtful measures for the control of trachoma in India even if this were likely to appeal to our financial experts. The curtailment of trachoma will probably follow on better conditions of housing, feeding, social education, e.g., the emancipation of women (notably in Mohammedan races). In brief, its eradication is largely dependent on a betterment in the general care of the public health, and the beginning of its prevention must originate in the progress made in this important function of the State.

LECTURE II.

Venereal Disease.

Venereal diseases, the sequelæ of corneal traumata, and acute corneal ulcerations not included under previous headings.

Ophthalmia neonatorum (Gonorrhœal conjunctivitis of the new-born)

The venereal disease which has the greatest interest in connection with preventible blindness is ophthalmia neonatorum, sometimes referred to as Blenorrhœa or ' baby's sore eyes.' It is an acute conjunctivitis due to infection with the gonococcus which gains access to the child's eyes at the time of delivery. When the maternal passages contain this organism it is always possible for the newly-born infant to become infected if precautions are not taken. Should this happen the newly-born child's eyes soon become red and œdematous and a thin purulent discharge exudes from between the swollen lids. This acute conjunctivitis is liable to be associated with ulceration of the cornea, perforation, and loss of the eye ; or, as is more frequently the case in this part of India, the ulceration may be milder and eventually heal with more or less opacification of the cornea. The condition is easy to diagnose clinically, but should always be confirmed by detecting the gonococcus in the discharge when examined microscopically. Other forms of blenorrhœa of the new-born are met with which are clinically very similar to the gonorrhœal affection, but in which the gonococcus is not found. They too are severe and likely to produce great damage if not treated.

This disease has been known and dreaded by accoucheurs for many years and its seriousness as a blinding affection has been fully recognised by both obstetricians and ophthalmic surgeons. In western countries it is said to be the greatest single cause of preventible blindness. In England and Wales it is held to account for 10 per cent of the total blindness. Now this is a very interesting point because it is certainly not the greatest cause of preventible blindness even in children in India. Why this should be so is not quite clear, but I have elsewhere advanced the suggestion that here in Madras at any rate we are

dealing with a strain of gonococcus which is not so virulent as that which is responsible for the disease in England. At one time we thought that perhaps the rate of occurrence was much less than elsewhere, and we were advised that it was very seldom seen in our sister institution, the Government Hospital for Women and Children. Careful investigation showed that this was not the whole truth. In one year we collected quite a large number of cases amongst babies born in the Hospital for Women and Children. Many of them did not give the clinical appearance of classical ophthalmia neonatorum, but microscopic examination proved their true nature. This was not because of the nature of the prophylactic treatment, for different methods had been used, and some children had no prophylactic treatment at all. It was apparently due to the fact that the affection was mild in nature, and a possible explanation is, as mentioned above, a difference in the strain of the infective organism. It is highly probable that the condition is more prevalent in the mofussil villages where skilled medical attention is not available than in cities such as this. Even so, the mofussil cases which we do see here tend to be mild. Taking figures for our ophthalmic hospital population we find that its incidence for ten years averaged 42 per annum in an annual hospital population of 20,000, that is about 2·1 per 1,000. This, as you will remember from our first lecture, is a far lower incidence than that of keratomalacia. The relative significance is also affected by the frequency of other conditions such as the effects of small-pox, and irritant remedies, which now-a-days are not prominent causes in England and Wales. As time passes and the general social conditions and public health of a country improve, the picture of eye disease changes. One has only to look at Dalrymple's atlas of eye diseases published in London in 1852 to realise that the affections depicted as prevalent at that time in London, and now much rarer there, are common in our Madras out-patient department to-day. If we consider the relatively small number of cases which we do see, it is also noteworthy that very seldom indeed does the disease produce blindness. This, perhaps, is largely because of the energetic treatment given, but even cases which come late rarely go on to blindness, so that we have come to form the opinion that ophthalmia neonatorum is not nearly such a potent cause of blindness in India as it is in

the West. This does not mean that we should relax our efforts to prevent infection. As you may imagine a condition which is said to be the greatest cause of blindness at all ages in England and Wales, and which is definitely preventible, has stimulated a great deal of effort there in connection with its prophylactic treatment. It was recently found that in spite of a known efficient prophylactic treatment the rate of incidence still remained about where it was a number of years before. It was therefore regarded so seriously that exceptional measures have been adopted to stamp it out. The Council of British Ophthalmologists recommended the Ministry of Health to establish ophthalmia neonatorum centres all over the country, and to make it compulsory for nurses, district nurses, midwives and medical students to attend at one of these centres for practical instruction.

For many years it has been known that a prophylactic treatment known as Credé's method is a certain way of preventing the disease if properly carried out. This, or some equivalent modification, is adopted in most of the lying-in-hospitals of England and Wales and those elsewhere in Europe. It may be of interest to give the details of Credé's own directions :—

'As soon as the umbilical cord has been cut, the child is to be freed from the vernix caseosa with the adherent blood and mucous in the usual way, and then placed in a bath. The eyes are to be washed with a clean cloth, or better absorbent cotton, not with the water of the bath, but with other clean ordinary water. Then, before the baby is dressed, each eye should be opened a little by means of two fingers, and a single drop of 2 per cent solution of silver nitrate brought in contact with the cornea and allowed to drop upon it. No further attention is to be paid to the eye. The instillation must not be repeated if during the next twenty-four or thirty-six hours, there should be a slight redness and swelling of the lids with a mucous secretion.'

It would probably be easier and safer to instil the drop of silver nitrate by letting it fall from a dropper upon the conjunctiva at the inner angle of the eye or in the gap between the lids without touching the cornea rather than try to follow the detail of the original description. One per cent silver nitrate is more generally recommended now-a-days by British ophthalmologists than 2 per cent. The chief thing is that it should be

employed in all cases unless it is absolutely certain that neither the mother of the child nor the father has had gonorrhœa. It would be only reasonable to insist that neither doctors or midwives be qualified to practise in India until the medical authorities are satisfied that they have had a practical experience of the prophylactic treatment of ophthalmia neonatorum as suggested by the British Council of Ophthalmologists.

(To be continued)

THE LAWS OF INDIA: SHOULD THEY BE SCRAPPED?

BY

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The principles of Hindu Law were enunciated more than three thousand years ago. It is indeed a matter of joy and pride to every Indian that Indian intellect and Indian talents had the vision and wisdom to produce a set of rules and laws for the proper conduct and guidance of Indian society at a time when the other nations of the world were non-existent, or if they did exist, were barbarous or semi-barbarous and the notion of any law was remotest from their minds. But splendid as was the lead in law that India gave to the world thanks to the genius of Manu, the mightiest of law-givers that ever trod on ancient Indian soil and his stalwart successors, Gautama, Sankha and Parasara—to mention but a few names—and thanks also to the Vedas, Mantras and Sutras—the 'uttered thoughts' of India's inspired seers, and the immemorial 'usages' of the peoples of India, it is greatly to be pitied that to-day, judged by modern standards, the laws of India are comparatively crude, out-of-date and primitive and are better fitted to be consigned to a first-class museum as a glorious relic of India's antiquity than put into use to meet the needs and requirements of a race such as the Indian race which certainly is not the same to-day as it was in the day of Manu and which has progressed vigorously in every walk of life and thought during the past fifty years to a degree that makes Hindu law nothing short of an anachronism simply allowed to be in force because there has not emerged yet a modern Manu who would have the courage to denounce it in the same way as Manu of old propounded it. India to-day does not crawl on chariot wheels or double bullock carts but gallops on Fords and Rolls Royces. Indians do not shun the forbidden seas any more but cross them with an easy conscience by means of motor vessels, some of them even resorting to aeroplanes; the wireless, telegraph, trans-oceanic telephones, talkies and television have brought the world to India's very door. The

annihilation of space and distance by means of express locomotives throughout the length and breadth of India has brought the divergent castes and communities of India incredibly closer. A keen sense of patriotism resulting in a national upheaval and a common aim and aspiration in regard to the political, social and economic welfare of India, have made the disjointed warring India of old with millions of internal problems and disturbances, a solid, united nation. Territorialism and communalism are slowly disappearing and in all things that matter India's outlook on life and things to-day is a world outlook compared with her erstwhile narrow and provincial outlook. Indian schools and colleges modelled on Western lines and the tremendous influence of the West and particularly that of Great Britain are spurring India on towards ultra-modernism. India's superstitions and ignorance, her racial differences and communal animosities will all be soon things of the past and by quick degrees, whether she likes it or not, India will be 'modern' in every sense of the term like her sister nations of the world.

The question now arises—and it is a very important question—has Hindu law kept abreast of the tremendous strides India has made towards advancement in recent times? Has the progress of Hindu law been commensurate with the growth of modern India? Is not Hindu law obsolete and must therefore be scrapped?

The answer to these questions must necessarily depend on what the Hindu law is to-day and what India is to-day. We have seen in the foregoing paragraph that India is tending to be modern, and is already quite modern in many respects. Can the same be said of Hindu law? Emphatically 'No'. The origin of Hindu law goes back to several centuries before Christ—to roughly about 1280 B.C. The Hindus claim that it is mainly divine in its origin, being the revelation of inspired seers and the institutes of revered Sages handed down by word of mouth from generation to generation. It is also human in this that at a later stage the approved and immemorial 'usages' of the people supplemented the divine law of India. It was on these lines that Manu and Yajnavalkya propounded Hindu law nearly three thousand years ago. The principles underlying them are indeed sound and even remarkable when one considers that they were the results of human thought as early as 3,000 years ago. In a law such as this

there would be indeed no holes to pick if Indian society had remained stationary these 3,000 years, but time has considerably altered the whole fabric of Indian society and Indian thought and the application of Hindu law to 'New India' is like putting new wine into old bottles or hitching the 'Flying Scot' on to a goods wagon. If Manu were only to come back to life and see for himself aeroplanes and motor cars sweeping past him, the extraordinary change in Indian manners and customs, the miraculous linking up of places and communities, the incredible merging of races and castes, and the astonishing tolerance and laxity in religion, he would surely offer profuse apologies for conspiring with the other law-givers of his time to bind hand and foot Hindu society by a set of rules known as the Hindu law which while on the one hand helped to solve legal problems at the time, has on the other tended to enslave Hindu society for ever. The Hindu is a born conservative and being a zealous stickler for religion he prizes the Hindu law which is based on Hindu religion as a priceless gift from God, and would sooner die than in any way attempt by word or deed to belittle the Hindu law—to do which, according to him, would be nothing short of blasphemy. True he is himself modernised every day, but out of respect for his religion and a sneaking regard for all that is 'ancient' he would far rather let himself be judged by the antique law of India than submit himself even in the slightest degree to any departure from it. This is indeed the reason why all these 3,000 years the Hindus have silently suffered themselves to be judged by a law which at its best is a 'curiosity' and at its worst a 'hindrance' to the progress of India. It is for the same reason too that no modern Manu in the shape of a law reformer has dared to come yet on the scene.

It may be asked in what respects the Hindu law as administered to-day is defective and unsuited to modern thought and requirements. It is a question that by its nature necessarily involves a thorough discussion from line to line and page to page of all the standard treatises on Hindu law, beginning with the sources right up to the recent 'decided cases' and the latest legislative enactments. In an article such as this, it is not possible to delve deep into the subject and the only way it can be answered is by a sweeping generalisation of a few glaring defects which might afford sufficient thought for the budding jurists to

ruminate upon and the powers-that-are to ponder over. The main purpose of this article is to set up a healthy controversy over the subject of Hindu law and create such an interest among the legislators, judges, politicians and students of India that it might inevitably result in the administration of a more modern law than that which is at present in vogue.

First and foremost the Hindu law is defective in point of time. Three thousand years have made a world of difference to India and it seems ridiculous at the present age to try to conform to modes and methods, faiths and beliefs, and customs and manners of centuries before Christ. India has moved since then and moved so swiftly that should the graves by some freak of nature give up in flesh and blood the ancient authors of Hindu law, they would slink back to their holes with fright at the sight of a land and peoples that they could not recognize.

The next most baffling and bewildering thing about the Hindu law is its different schools and the consequent lack of uniformity. It was all right in those days when a province was a separate unit with no earthly chance of contact with the neighbouring provinces. Now they are all interlinked by means of rapid transport and communication with the result that the different schools have overlapped to such an enormous extent that the maintenance and preservance of different schools intact, and the application of special and exclusive laws to separate and different provinces have tended to cause confusion which is being made worse every day by inter-racial and inter-communal marriages, immigration of peoples from one province to another, the births of new religions, the adoption of new customs and manners, and the increasing change in the daily outlook on life. It is time the Bengal, Mithila, Benares, Bombay, Madras and the Punjab schools were completely scrapped and the broad divisions that they fall under, namely the Mitakshara, Dayabhaga and Mithila, were further reduced to one common uniform school to which the whole of India could easily conform without confusion.

In regard to the law of succession and inheritance, there is a great deal of confusion and ambiguity. It often arises with regard to tracing relationships from the propositus. The method of determining relations such as Sapindas, Sakulyas, Samanodakas, Sagotras, Samana Pravaras and Bandhus by means of what is known as the ' funeral oblations' or ' Pinda Theory' must go and

an up-to-date and modern method must be substituted. The Hindus are gradually discarding their caste marks and most of them are even giving up their daily 'Pujas'. The 'Pindas' therefore are also bound to go if they are not already gone sooner or later. How then relationship is going to be determined in the future? In a country like India where there are no such things as baptismal registers to record names or ages and where parents do not bother to record in writing the names of their own children for future reference or guidance, it is extremely difficult to trace one's relations up to the seventh or fourteenth degree as required by the Hindu law for purposes of inheritance, marriage, mourning or adoption and the genealogical tree affords great scope and temptation for an ambitious adventurer or 'impostor' to creep into the family tree as an agnate or cognate. It is such frauds, ambiguities, confusions and uncertainties that have unquestionably made India the most litigous country in the world. As for women, there has been no attempt to improve their lot either as property holders, inheritors, wives, mothers or widows, and all the way through they play a passive part rather than an active part, and in many respects treated more as chattels than human beings with a will of their own. Talk of 'equality of sexes' and 'fair play' for all, it is all moonshine according to the Hindu law and till the Law that has doomed them to eternal serfdom and slavery is reformed there seems to be no hope at all for the women of India.

The joint family system deserves condemnation. It makes idlers in the family more idle and the ones with initiative and courage, less enterprising by its restrictions and cautious and meagre distribution of funds for domestic or business purposes. In modern parlance it is a sort of 'dole' which encourages 'unemployment' and breeds sluggish ways among its component members. The young man grows up to be a 'ninny' with his eyes always fixed on the 'family property' and actually collapses when it is wrested away from him or he is wrested away from it. It is a system which often encourages the living of fifty or more members of one family in a small ill-ventilated, insanitary dwelling place with no privacy or seclusion and with no earthly chance for thinking, studying, or developing one's individuality. The only 'recreation' of the members consists of quarrelling or squabbling over their respective shares. Can you wonder why

the Indians have not had much time or opportunity for mechanical or industrial invention.

The Hindu law as we have seen is based primarily on religion. In as much as religion is not uniform in India, there are bound to be irregularities in the law which originates from it. Superstitions in many instances have assumed the garb of religion and stealthily crept into it ; customs of an objectionable nature have also found their way into it. Take for instance the question of sonship: There are fourteen kinds of sons ! Son by a concubine, son born of an unmarried girl, and son born in secret are all embraced in the generous arms of Hindu law. It is not the morality of it that worries one but the confusion arising when property has to be 'inherited'. Similarly there are 'approved' marriages and 'disapproved marriages' and one of the 'approved' forms of marriage consists of the giving away of the girl in lieu of fees to a bridegroom who officiates as priest in a sacrificial ceremony. Yet another 'approved' form of marriage consists of the giving away of the girl by the father to a bridegroom in return for a pair of cattle ! Of the 'disapproved' forms of marriage which are not actually invalid two may be mentioned, namely : (1) The sale of a daughter and (2) the capture of a girl after her relatives have been killed or wounded. Polygamy, concubinage and child marriages are instances of further evils in Hindu law that must be eradicated. The forbidding of inter-racial or inter-caste marriages and the deliberate tendency to keep down the Sudras and the depressed classes are also instances of injustice that are highly to be deprecated in the Hindu law. The effect of all these, it may be noted, has been to split the Indian race into hundreds of sects, castes and divisions and keep them always apart in such a manner as to make them a disunited, disjointed nation incapable of combining or uniting for the common welfare of India. It is a thousand pities that India's backwardness and slow progress have after all got to be traced to its own self-imposed laws which have gripped her as it were in a vice and enslaved her these many centuries.

The jurists who have justified the existence and continuance of Hindu law from time to time have argued that Hindu law is never stationary but always advances with the times with every legislation and every decided case. It is a poor consolation to satisfy oneself on these lines because the legislature does not often

dare interfere with the religion or the customs and manners of the peoples of India and what interference there has been from this quarter is totally negligible. As for 'decided cases' being a source of law and a help towards modernising the Hindu law, they have certainly helped to increase the quantity of the Hindu law but not the quality which is the same as it was in the days of Manu. The bench have scrupulously clung for ages to the principles inculcated by Manu and his followers and the result is that apart from the fact of the law being stated more clearly in 'decided cases' there is no radical change so far as the law itself is concerned and the tendency of the bench to cater for the religious, customary and superstitious idiosyncrasies of Hindu law have been singularly marked and definitely pronounced. And what is more the heaps of decided cases which are often in conflict with one another and which have helped to swell the bulk of Hindu law to a ridiculously monstrous size have added new difficulties and made confusion worse confounded. For instance for every 'decided case' that a counsel for the appellant cites before their Lordships of the Privy Council in order to substantiate a point of law, the counsel for the respondent perhaps cites two or more 'cases' in support of his contention which are diametrically opposed to that quoted by the counsel for the opposite side, which only go to prove the conflicting nature of the 'decided cases' and their lack of uniformity. They are certainly no help to the judges or the counsels and if anything they are a source of annoyance to the bench and the bar.

What then is the remedy ?

I say emphatically—modernise the Hindu law, simplify it and standardise it. Scrap the unnecessary elements retaining only those that are absolutely useful and necessary. Purge it of all ambiguities and superstitions and customs and manners that are objectionable and let legislation play a free hand at giving it a perfect trim. Codify the 'Case Law' and reduce its bulk to the absolute minimum commensurate with legal requirements. Make it more secular and less religious. Strive at uniformity all over India and abolish all things that are out-of-date and obsolete that tend to retard India's progress. In a word pull 'Hindu law' out of the rut into which it has fallen and give it a new start on modern lines, that it may be of real service to the India of to-day.

Perhaps a commission of legal experts can devise ways and means to draw up a scheme for modernization and standardization of Hindu law. Why not bring such a commission into existence at once? It would be splendid if at the same time as the Supreme Court comes into being in the future Federal Constitution of India that the new Hindu law is also brought into effect. There is no question that the reformation of the Hindu law is an urgent necessity and India awaits with eagerness the advent of a modern Manu.

CORRIGENDA

PAGE	LINE	INSTEAD OF	READ
189	16 (from below)	A/(1-a)	a/(1-a)
195	5 (from top)	E_a	E_p
195	6 (,,)	e	e_a
195	7 (,,)	E	E_a
195	9 (from below)	E_q	E_a
198	8 (from top)	10^6	10^9

GAMMA RADIATIONS AND ATOMIC NUCLEI

BY

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During the last four years our stock of information concerning the relation between radiations and atomic nuclei has considerably increased. This can easily be seen when we compare what we actually know, with what was known in 1930, when the standard book on the matter: 'Radiations from Radioactive Substances' by L. Rutherford and collaborators, was published. This volume constitutes a real landmark in the history of the researches on atomic nuclei: not only has it gathered all the main results and what led to it, up to that time, but it also pointed the way to future researchers by emphasising some theories just cropping up at that time, as well as by suggesting original explanations for some up to then unexplained facts. Some of these suggestions have by this time become almost a matter of course, which shows the insight and foresight of the authors, as well as it goes to prove the thesis that new theories most naturally follow upon and are but the outcome of newly discovered facts, which although at first suggested by the older theories, when examined in detail are found not to square exactly with them.

This article claims no originality, except in so far that it brings together facts and theories which are only found scattered in a multitude of articles in different reviews.

I. RADIOACTIVE DISINTEGRATIONS

'We have little if any definite information on the internal structure of nuclei to guide us', thus wrote the authors of the above cited book (p. 524). Even now, it must be confessed, we have little definite information on this subject, yet undoubtedly a wealth of experimental data has been accumulated concerning the interactions between atomic nuclei and γ radiations.

Up to 1928, all what was known about these radiations, was that in the radioactive disintegrations they proceed from the

nuclei themselves and do not originate from a change in the levels of the outer electronic structure. It was also known that many of the β particles originating in these same disintegrations, were due to these very γ rays, which projected the outer electrons out of the atom by a process similar to that of the photoelectric effect. This discovery afforded an excellent method of studying the γ radiations by their β ray spectra. For α and β radiations can easily be studied, because, being electrically charged, they can be deflected by means of a strong magnetic field. In this way from the curvature of their respective paths for a given field, the intensities of the different radiations can easily be studied. γ radiations, being of an electro-magnetic nature, cannot be studied in this way. However since they give rise to β rays and to β rays of different energies, as can easily be understood from the analogy with the ordinary photoelectric effect, it was found possible to determine the energy of the different γ radiations by examining and measuring the β ray spectrum they produce.

That such measurements go not without many difficulties and complications, can easily be gathered from the masterful exposition of this topic in the already referred to book of Rutherford. By dint of patient labour much information has thus been gathered and is still being acquired concerning the various γ radiations emitted by different radioactive substances.

Besides the method just referred to and known as the excited corpuscular method, which is an indirect method, there exists another direct method, the crystal method, where the wavelength of the γ radiations is measured in a way similar to that used in X-ray spectrography. However the difficulty in the case of γ rays was much greater because of the extremely small glancing angles required for such high frequencies as those of the γ radiations. Thus the Frenchman Frilley measured a γ ray of wavelength about 16 X. U., (X. U. $= 10^{-11}$ cm.), which radiation has a glancing angle of less than 10 minutes and is but feebly scattered by the crystal. However these experiments were extremely useful because they showed the reliability of the relatively easier but indirect way of the excited corpuscular method. At the same time these last experiments constitute a corroboration of the Einstein photoelectric equation as well as of the above given explanation of the β rays emission in radioactive disintegrations.

Having in this way obtained a lot of information about those γ radiations, the next question was to explain their origin. As we have said, it has been proved that they must originate in the nucleus itself. Several explanations have been proposed, of which the latest was simultaneously proposed by Gamow and by Gurney and Condon. This theory, based on the Wave Mechanics, has proved very useful, at least in its general outlines. It was devised to explain the origin of α particles from radioactive nuclei, and in particular to interpret some contradictory conclusions deduced from measurements on the scattering of α particles by heavy radioactive substances on one side and from measurements of the energy of the α particles emitted by these same substances. For it was found that the values for the size of the uranium nucleus as deduced from these two sets of experiments do not agree. These contradictory results were difficult to reconcile on the basis of the classical theories, however the new Quantum Mechanics afforded a ready explanation. In this theory, it is supposed that the atomic nucleus is made up of a heavy central core surrounded by lighter elements, mainly α particles with a few neutrons and possibly a proton. The whole of this aggregate having only a radius of the order of 10^{-12}, all these elements are very closely packed and must be kept together by still unknown forces. The stability which is thus brought about, is rather to be compared with that of a waterdrop, inside which the various forces neutralise each other, whilst all around they constitute a kind of protecting sphere. These internal forces are attractive forces, varying inversely as the fourth or fifth power of the distance from the centre. Superposed on to these forces, is the ordinary repulsive Coulomb force, whose effect is prominent at farther distances from the centre. There will therefore be a critical distance R_0, for which both forces will have equal absolute values; this is the potential barrier of the nucleus. Suppose an α particle is fired at the nucleus, possessing sufficient energy to overcome the repulsive force even at its strongest, then it will cross the potential barrier, and once inside, it will be strongly attracted towards the centre. The same holds good for an α particle which is originally inside: unless it possesses sufficient energy to overcome the strong attractive forces, it will not be able to cross the potential barrier. At least this is the conclusion according to classical Mechanics, but according to

Wave Mechanics, we can only with a certain degree of probability foresee the position of a particle in a given field of forces, such as the one that prevails inside the nucleus. This probability depends on the momentum of the particle and on the intensity of the field at that point. Hence it follows, that there is a certain probability for the particle of being found in regions where according to classical Mechanics it could not possibly exist. On the score of this, Gamow calculated the probability for a given α particle of escaping from a given nucleus with a given potential. He thus found back the empirical relation of Geiger Nuttal, which connects the probability of disintegration of an atom with the speed and hence the momentum of the emitted α particle. This theory was then further expanded by Gamow to explain certain unexpected phenomena, which had been discovered concerning these α particles emitted during the radioactive transformations.

Until very recently it was believed that each radioactive substance emitted but one characteristic mono-kinetic α radiation, that means that all the particles are expelled with identical speed. In fact the magnetic spectrum method by which these radiations were studied, showed only one characteristic line for each substance. However the resolving power of the instruments used was rather limited, so that small differences in the α radiations could not have been detected. Only a few rare observations seemed to contradict the above statement. As far back as 1910, attention was drawn by Miss Blanquies on some abnormalities in the Bragg's absorption curve of α particles from AcC, which, she suggested, might be explained by admitting α particles of various ranges. In 1916 Rutherford and Wood, definitely observed long range α particle emitted by ThC. Since then many experiments were carried out investigating this point, so that finally all doubts about it were removed and it was definitely established that these long range α particles are of nuclear origin like the others.

It is interesting to read in Rutherford's book a first tentative explanation of this phenomenon, much of which was in fact taken up in Gamow's interpretation: "we may suppose that the long range particles do not exist in the nucleus with their abnormally high energies, but that they are particles of the normal groups which have received in some way, just before their ejection, an

extra supply of energy" (p. 94), although the main idea is similar to that of Gamow, yet it may also be said that Gamow's explanation is just the other way about, in so far at least that for him the long range particles alone show the real energy possessed by all the α particles when they are inside the nucleus in the normal state. Gamow was led to his theory by the more refined researches on the velocities of the emitted α particles. One way consisted in improving the magnetic spectrum method, this was done chiefly by Rosenblum and collaborators with the help of the large Paris electro-magnet, which gave constant fields over relatively large areas. (Journal de Physique, I, p. 438). He used and perfected the focussing method and thus succeeded in obtaining sharp and well defined lines. In this way he discovered what has been called the fine structure of the magnetic spectrum of α particles. Rutherford and collaborators used a counting method, depending on the linear magnification of the ionisation current, due to a few millimetres of the track of an α particle. The momentary current, amplified by means of valves, was recorded on a photographic film by a special oscillograph. By using a double ionisation chamber, it was found possible to record only those α particles which were stopped in the shallow ionisation chamber. (Proc. Roy. Soc., 131, p. 702, and 129, p. 217). In later experiments (Proc. Roy. Soc., 139, p. 617), Rutherford combined the focussing method of the magnetic spectrum with a direct electrical counter amplified by means of thyratrons. The experiments were conducted with the greatest accuracy, so that a high precision could be claimed for the measurements, evaluated at 1/5000.

All these experiments as well as many other varying in technical details, have led to the conclusion that at least many of the radioactive substances emit several groups of α particles of different velocities. These differences in the velocities, were carefully studied by Rosenblum in the case of ThC, and before Gamow published his theory, he had the idea of comparing the different energies of the α particles with those of the γ radiations emitted by the mixture Thc (C + C″), he had thus found some striking connections between the two kinds of radiations. However Gamow was the first to suggest a well defined explanation of this relation between the two radiations apparently emitted at the same time.

According to Gamow, and contrary to Rutherford's suggestion quoted above, initially all the α particles exist in the same fundamental state inside the potential barrier proper to that nucleus. When disintegration occurs, as explained above in Gamow's theory, this may take place in two different ways. In the first case, the α particle is simply emitted, and then its kinetic energy, which will be that of a long range particle, corresponds to the energy it possessed inside the nucleus in the normal state. In the other case, a secondary intra-nuclear change has first taken place: before the emission the nucleus is excited, for instance by the emission of a β particle, and all the α particles are no longer in the same energy state, so that in this case the α particles emitted will have various energies. Since the nucleus cannot remain long in an excited state, by returning to the normal state, it will emit its surplus of energy in the form of a γ radiation. The energy of this last radiation will of course be equal to the difference in energy between the two or more kinds of α radiations which the nucleus emits when in the excited state. (Proc. Roy. Soc., 136, p. 752). This theory of Gamow therefore explains the relation between α rays and γ rays in the same way in which the spectra of optical and X rays are related to the outer electronic structure of the atoms.

As was said, upto these last months, many and varied experiments have been carried out to study the fine structure of the α radiations, and along with these, as soon as Gamow's theory showed the relation between this fine strcture and the γ rays, a whole series of experiments was started to study the energy as well as the intensity of the various γ rays emitted by the radioactive substances that emit γ particles, in order to test quantitatively the truth of Gamow's theory.

In certain cases, the fine structure of the α particles was discovered first, and afterwards the γ radiation, which should accompany it, was looked for, and, when discovered, its measured energy was collated with the calculated value. In other cases it was the γ radiation or radiations that were first discovered and then the corresponding fine structure of the α radiations was looked for. The experiments however were not always successful, the reason being that at times the intensity of the expected radiation when compared with the principal radiation, is so

small that it is almost impossible to detect it. A few examples out of many will show this very clearly.

Lewis and Wyn-Williams had found that the α rays from actinon were complex, consisting of two groups differing in energy by about $3'5 \times 10^5$e-volts, about 16% of it being emitted in the lower velocity group. (Proc. Roy. Soc., 136, p. 349). Rutherford and Bowden, on receiving this information, by means of an ingenious experiment looked for and found the γ radiation corresponding to this complexity of the α rays emitted by actinon (Proc. Roy. Soc., 136, p. 407). From absorption measurements they derived a value for its energy of the right order to be expected from the difference between the energies of the α particles. However very accurate measurements could not be made, because the sources of actinium available were not strong enough.

Already in 1930, Bothe and Becker, during their famous researches which finally led to the discovery of the neutron, were led to examine whether polonium does not emit a γ radiation. They succeeded in discovering it, however its intensity is very small so that it is not astonishing that so far the corresponding fine structure of the α rays emitted by polonium has not been observed. (Zeitschrift fur Physik, 66, p. 313.)

The most interesting example in this series remains that of Th(C + C″) which in fact led to Gamow's theory, and which was therefore studied in great detail by many different researchers. Thorium C, as is well known, disintegrates in two different ways. Only one of these interests us here, the one in which by emitting an α particle it becomes ThC″, which then by emitting a β particle becomes lead. Since ThC″ is very short-lived, it is very difficult to examine the disintegration of it separately, so that it is difficult to verify, what was generally admitted, that the totality of the γ radiations emitted by the mixture Th (C + C″) is exclusively due to the disintegration of ThC″. Rosenblum by his refined methods discovered that not only ThC′, but also ThC emits several groups of α rays. Gamow from this inferred the existence of a corresponding number of nuclear α particle states, and concluded that ThC also should emit γ radiations. To test the truth of this a priori statement many researchers set to work, especially Ellis at Cambridge and Meitner in Germany. Ellis examined the β ray magnetic spectrum of the recoil atom

of ThC″, thus separating them from the mixture Th(C+C″) and compared this spectrum with the similar spectrum of the mixture. By discussing the absence of some lines in the latter spectrum as well as the difference in intensity of some of the lines present in both spectra, he came to the conclusion that some of the radiations giving rise to these lines were produced immediately after the disintegration of Th C and before the disintegration of ThC″, in agreement with Gamow's theory. However Meitner as a result of her experiments, concluded at first to the contrary. This was at the end of 1931 but in 1933 Meitner and Philipp measured again the magnetic β ray spectrum of an intense source of ThC″, isolated from ThC', and found that some of the lines due to Th (C+C″) are absent in the spectrum of Th C″ ; hence this time they arrived at the same conclusion as Ellis, corroborating Gamow's a priori deduction based on Rosenblum's discovery of the fine structure of the α rays emitted by ThC.

These and similar researches have led to admit at least as a working hypothesis the theory of Gamow that the penetrating γ radiations emitted by radioactive substances are due to different states of the α particles in an excited nucleus. As Ellis remarks (Proc. Roy. Soc., 136, p. 751), the above theory is based on the assumption that the principle of the conservation of energy applies to the nucleus, or better, to that part of the nucleus which is associated with the emission of α particles and the emission of γ rays. In both cases, what has been established, is the equivalence of the total amount of energy emitted when this energy can be divided. Either an α particle carries away all the available energy, or if it takes only part, the remainder is emitted in the form of γ rays. A more detailed explanation is still to come. In particular how to account for the excitation of the nucleus, which seems to be due to the emission of a β particle, whilst the emission of an α particle hardly produces any change, except at times a shift of an α particle from a lower to a higher energy level accompanied by the emission of a γ radiation of corresponding energy.

In connection with this problem it may be interesting to mention a recent attempt of Gamow to explain the γ excitation of the nucleus in the case of a β disintegration (Nature, 131, p. 57, January 1933). He assumes that every nucleus is built up of α particles, neutrons and, for elements of odd atomic number, one

proton. All the α particles are placed on the same energy level, two on each. Suppose now that for one reason or other one of the nuclear neutrons is unstable, and, releasing an electron, is transformed into a proton. This will rather happen to a neutron in the higher levels, because here less work will be required to extract the electron from the nucleus. The proton thus formed, being on a high level will fall towards the centre, and in doing so will emit a γ radiation. This would explain why the β disintegration is often accompanied by the emission of hard γ rays.

Of late some more precision has been obtained about the different energy levels of the α particles inside an excited nucleus, by extending to these levels, considerations at first applied only to the outer electronic structure of the atoms. As we have said, the γ radiations emitted by radioactive substances are often photoelectrically absorbed in one of the electronic shells of the atom, and thus produce the β ray spectrum characteristic of the energy of the exciting γ ray. The probability that the γ ray will be absorbed by one of the planetary elements of the atom is called the internal conversion coefficient of that γ ray. If we call a this coefficient, and A the probability per unit time of the emission of a γ ray by the nucleus, then the number of electrons ejected per unit time is Aa, and the number of quanta escaping unabsorbed is A (1-a). What is actually measured by experiment is the ratio A/(1-a), from which a is then deduced. Ellis and Aston have obtained such values of a for certain γ rays from RaC and RaB. In December 1932, two theoretical calculations of this conversion coefficient were published by Hulme and by Taylor and Mott respectively. Hulme considered the radiation field of an excited nucleus as that of an oscillating dipole, that is the field emitted, according to Quantum Mechanics, by a radiating system in transitions in which the quantum number j, specifying the total angular momentum, changes by unity. Hulme made use of the accurate relativistic wave equation and thus succeeded, much better than previous authors, in deducing theoretical values of the conversion coefficient which agreed fairly well with the experimental values. However for some radiations, the agreement was less good. To account for these, Taylor and Mott repeated Hulme's calculation for quadripole radiation from the nucleus. A radiating

system emits the field of a quadripole in transitions where the quantum number j changes by two, or in certain cases by zero. (P.R.S., 138, p. 665). The authors showed also that octopoles, etc. were extremely improbable. For some rays they obtained values of α quite similar to those obtained experimentally.

This interpretation was made use of by Rutherford, after he had analysed in great detail the long range $\prec$ particles from Ra C′ by means of an annular ring magnet capable of focussing groups of α particles after these have traversed a semi-circle of 40 cms. radius (P.R.S., 142, p. 347). He thus discovered 12 different groups of $\prec$ particles. Calculating the corresponding energy levels of the excited nucleus, he found that all the γ rays emitted by Ra C′ can be correlated with these levels, if four other levels are added, which do not correspond to any observed α particle groups. Yet on measuring the relative intensities of the various groups, he found that the excess energies of many of the calculated $\prec$ particle levels do not correspond to the strong β ray groups of the γ ray spectrum. A satisfactory explanation was found in the theory of the above quoted authors, which classifies the γ rays into dipole and quadripole. Consequently quantum numbers were assigned to the nuclear levels of the RaC′, as had already been done by Ellis and Mott for nuclei of the Thorium series. The internal structure of the nucleus is, in this way at least, made to resemble very closely that of the outer electronic structure of the atom. However the great difference remains that for the nucleus all the particles, $\prec$ particles, proton and neutrons are packed very closely, and the forces at work there must be quite different from the Coulomb forces in the outer structure.

Thus gradually more information, theoretical as well as experimental, is obtained concerning the excited nuclei of the heavy atoms. A fully detailed and in all points quite satisfactory explanation has not been proposed yet. The reason no doubt is the difficulty of making accurate and reliable measurements which should supply the theorician with data sufficient to build up his theory as well as to verify it by the conclusions he derives thereof.

II. Artificial Disintegrations

Some 15 years ago Rutherford conceived the idea of artificially disintegrating the elements from an attentive study

of the spontaneous disintegrations which nature is continually displaying before us. In the same way the above theory of Gamow, first excogitated to interpret the radioactive disintegrations, was then most naturally extended so as to interpret some unexpected phenomena which occurred during the artificial disintegrations, and was thus made to throw some light on the internal structure of the nuclei of non-radioactive elements. Sir Hopkins said in picturesque language, at the anniversary meeting of the Royal Society, November 30, 1932 (P.R.S., 139, p. 12): 'The atomic nucleus for a long time had seemed to be an impregnable fortress, but missiles of high destructive power have been gradually contrived by almost magical skill in the army of attack, and the fortress, in spite of its formidable potential barrier is crumbling. It is interesting for the spectator to realise how much is learned by the commanders of the attack from the nature of the missiles (part of itself) with which the fortress replies to the bombardment.' This last consideration is in fact of the highest interest, it is precisely this point we want to expose somewhat more in detail.

Rutherford by directing a beam of powerful α particles in a vessel filled with nitrogen, observed the emission of protons, which he ascribed to the disintegration of the nuclei of this element. This was then further extended to other elements, and it is now known that the nuclei of all the elements from boron to potassium, with the exception of carbon and oxygen, manifest the same disintegration phenomena, when bombarded with powerful α particles. The observations of Blackett with the Wilson expansion chamber made it clear that the emission of protons was really due to the disintegration of the nuclei of the corresponding elements. By accurate measurements of the length and the direction of the tracks of the various particles resulting from the disintegrations, Blackett proved also that the track of the recoil atom after the collision with the α particle, corresponded to a new nucleus resulting from the absorption by the old nucleus of the α particle accompanied by the emission of a proton.

Since the velocities as well as the directions of the various particles before and after the inelastic collisions could be measured with sufficient accuracy, it was natural to apply to them the general laws of such collisions, to see whether the

principle of the conservation of energy holds good in this case. Of course the relativistic principle of the equivalence of mass and energy has to be assumed. Hence the equivalent masses of the kinetic energies of the travelling particles had to be introduced into the equations expressing the balance between the energy and mass changes during the disintegration processes. In dealing with such and similar changes, the kinetic energies of the travelling particles as well as the energies of the electro-magnetic radiations, if there are any, are now almost universally expressed in terms of the kinetic energy gained by an electron falling freely between a difference of potential v. in volts. To pass from these expressions to the atomic mass scale (where $O_{16}=16$) it is enough to know that a change of mass 1 on the atomic scale corresponds to 933 million electron volts; reciprocally 1 million electron volts corresponds to $1'07\times10^{-3}$ mass units. Similarly the energy of a free electron or a free proton is equivalent to about 311,000 and 964 million e-volts respectively. Since in artificial disintegrations there takes place a breaking up of the old nucleus followed by the building up of a new one, the energy equation will also contain a term referring to the 'packing effect' of the different nuclei, or the mass defect, as it is more commonly called nowadays. In analogy with the radioactive nuclei it is now generally admitted (or at least assumed) that all nuclei heavier than helium, consist of α particles, neutrons and at times a proton, the number of α particles being as large as possible. To bring and keep so closely together four protons and two electrons to constitute one helion, and similarly to make one single compact nucleus with several helions and other particles, strong binding forces are needed. These are got from the constituent particles, the mass of which has slightly diminished. This constitutes the packing effect, and the mass defect is precisely the difference between the sum of the masses of the constituent particles of the nucleus when free and their masses combined into one nucleus. It was calculated that the mass change of a proton from 1'0072 in the free state to a mass exactly 1, involves a change in energy corresponding to 6'7 million e-volts. The mass of an helion being 4'0011, whilst the mass of the four constituent protons and two electrons is 4'0301, the mass defect 0'029 corresponds to an energy loss of 27 million e-volts.

Taking all these data, obtained for a great part from the accurate measurements of Aston with the mass spectrograph, having besides measured accurately the kinetic energy of the various moving particles which take part in the non-elastic collision, Rutherford computed the energy equation to test accurately the balance between the energy and mass changes in the disintegration. This would show whether the principle of the conservation of energy is verified also in the actual case. He applied it in particular to the case of the disintegration of fluorine, for which accurate data were at hand. He found that the mass of the resulting nucleus (a neon isotope of mass number 22) could not be greater than 21'9937, whilst the value for the same nucleus found experimentally is about 22'0048. The agreement was not at all satisfactory and the difference was far beyond the range of error of Aston's measurements. Rutherford extended his calculations to other nuclei and thus discovered that not only there appears an energy change during the artificial disintegrations, but that this change is not even constant for the same kind of disintegration. In collaboration with Chadwick he found that the protons emitted by aluminium when bombarded with α particles, had ranges varying from 12 cm. in air to 70 or 80 cm. If we assume, as is probable, that the range of an α particle is proportional to the cube of its velocity, this corresponds to a variation in the energy of the emitted protons from 0'33 to about 1'1 or 1'2 of the energy of the α particles producing it. Hence in some cases there was loss of energy, in others gain. There appeared to be no other compensating energy change. An explanation had to be found. Rutherford at first suggested that the mass or energy either of the bombarded or of the new 'integrated' nucleus was not constant, or perhaps even both were variable, he suggested that this could be tested by experiments with the mass spectrograph. On the score of his hypothesis of the α particles gravitating inside the nucleus on various levels in a way similar to the outer electrons, he explained the slight variation in energy or mass for the different nuclei of the same element, by saying that the energy levels of the α particles inside the nucleus are not well defined. However such a suggestion seemed difficult to reconcile with the modern views on the nuclear structure and on the energy levels in general. This was perhaps the reason why in Rutherford's book, after

the above suggestion, there follows another suggestion or rather a consideration, which, as a matter of fact, contains already much of the explanation now universally adopted. It is therefore worth while to quote it at length : ' In this discussion of the energy relations in the disintegrations it has been assumed that all the energy is associated with the three particles the α particle, the nucleus, and the proton and that no other particle or radiation is emitted in the process. The best evidence that no positive particle is emitted is provided by Blackett's experiments, which refer only to nitrogen, but the emission of an electron or of radiation by the nucleus would most probably not have been detected in any of the observations which have been made. If one quantum of γ ray energy were emitted in each disintegration, the detection of the γ radiation would be a matter of some difficulty even if polonium, which does not itself emit γ radiation, were used as the source of α particles. The above discussion of the energy relations is therefore subject to certain reservations.' (p. 309.) How appropriate their reservations were, the authors realized it even before their book was completely printed, for at the end they added an appendix where they admit that their discussion on the artificial disintegration by α particles needs some revision in the light of recent work (p. 572). The work they alluded to is that of Chadwick, Pollard and Constable, which they shortly expose in that appendix, and which appeared at full length in P.R.S., 130, p. 463. Chadwick and collaborators had undertaken to examine in detail the artificial disintegration produced by α particles, they wanted in particular to measure very accurately the range of the protons emitted. For this they devised a detecting instrument of great sensitivity, thanks to the use of valves. Their work therefore was somewhat similar to that of Rosenblum on the fine structure of the α particles emitted by radioactive substances. We shall see that, like in Rosenblum's case, here also the measurements led to the a priori conclusion that those artificial disintegrations must be accompanied by the emission of γ rays. This was afterwards verified experimentally.

The Cambridge researchers found on bombarding many different elements with α particles, that in all cases, except for fluorine and sodium, the disintegration protons consisted of different groups having each a different velocity. They therefore

suggested that the particles and protons subsist in different well-defined energy levels inside the nucleus. When disintegration occurs, an α particle is captured and f i. remains in a given energy level $-E_a$, at the same time a proton is emitted from a determined energy level E_a. Supposing that the kinetic energy of the bombarding particle is e , we see that the emitted proton will possess an energy $e_p = e_a + E - E_p$, neglecting the small amount of kinetic energy taken by the nucleus. In case there are different energy levels for the α particles and protons, we shall find different values for e_p, the energy of the emitted proton, and this will explain the experimental results, what we might call the fine structure of the emitted proton's spectrum. Chadwick and collaborators suggested also another kind of disintegration, in which the α particle is not captured by the bombarded nucleus, it only disturbs the nucleus so much that a proton is being emitted. Of course to produce such a disturbance, the α particle will have had to give up part or even the whole of its kinetic energy. In this case then the energy of the emitted proton will be given by any value ranging from $e_p = 0$ to $e_p = e_a - E_p$, according as the α particle has lost in the process more or less of its energy. Since in this case the α particle is not captured, the term E_a is naturally missing. Hence it follows, that in the first case, disintegration with capture, we must have a definite group of fixed values for e_p, that is a kind of line spectrum for the energies of the emitted protons. In the second case, disintegration without capture, we shall have a continuous spectrum, since all the values between the two given limits, are possible. These two kinds of spectra were found experimentally by Chadwick, Constable and Pollard, for different substances. We should still a moment more consider the equation $e_p = e_a + E_a - E_p$: we can put it in the form $Q = e_a - e_p = E_p - E_g$. In the first assumption we might have said $e_a - e_p = 0$, neglecting the change in energy inside the nucleus, but, as we have seen, this cannot be neglected. In disintegration processes a change in energy Q, either positive or negative, always occurs. This is precisely the reason why it was concluded that α particles and protons are contained in the nucleus on different and definite energy levels. In some cases of disintegration, notably for boron, the authors had to admit that it could take place in two different ways. For they had observed two kinds of capture

disintegrations for boron, in both of which the isotope B_{10} is transformed into a C_{13} nucleus. However in one case this is accompanied by an energy change of $0'2 \times 10^6$e-v., and in the other case there is an energy change of $3'2 \times 10^6$ e-v. The authors therefore supposed that the disintegration with smaller release of energy gives rise to an excited nucleus, which very shortly afterwards changes into the stable nucleus corresponding to the disintegration with the greater release of energy. This explanation was extended to similar disintegrations with different releases of energy, as was the case with aluminium, as already observed by Rutherford. In both cases the final stable nucleus is produced relatively seldom in a single step, hence the long range protons will be relatively much rarer than the short range protons. It looks therefore as if a nuclear transformation is more likely to take place in a series of small steps with corresponding small energy changes, rather than in a single step.

We said that in the case of disintegration with small energy changes, the excited nucleus very soon changes into the stable nucleus, this of course cannot be done without a corresponding release of energy. The authors supposed that this energy might be emitted in the form of γ radiations, for which therefore the frequency could be calculated, since it could be known to what amount of energy it should correspond. This was but a suggestion of those authors, however not devoid of experimental support, since at that time already, Webster at Cambridge had obtained evidence for the production of a penetrating γ radiation, when aluminium was bombarded with α particles from polonium. It should be remembered that it was precisely in the case of the disintegration of aluminium that Rutherford had first found variable values for the energy changes.

Already in 1930, before Chadwick and collaborators published their results, Bothe and Becker from Charlottenburg, had examined carefully the artificial excitation of nuclear γ radiations, as they called their researches (Z. Phys., 66, p. 289). By means of a Geiger counter, taking many precautions, they had thus been able to detect the presence and also to measure the energy of the γ radiations emitted from different elements when bombarded with α particles. Along with the statement of their experimental results, they outlined an interpretation of these, which is very similar to the one published later on by Chadwick, as

explained above. They based themselves on Gamow's theory of the atomic nuclei of radioactive elements, and extended it to non-radioactive elements, examining all the different possibilities for a fast α particle to enter a nucleus and excite or even disintegrate it and thus produce an emission of γ rays. Just as Gamow had examined the various cases for an α particle which is inside the nucleus, to get out of it, with the possible emission of γ rays which might follow upon it.

Bothe and Becker found that in the case of boron, the energy of the emitted γ radiation, $2'8 \times 10^6$e-v., was in fairly good agreement with the energy difference between the two kinds of protons emitted in the disintegration of this element, as was said before. They found many more concordances of this kind.

Webster published his results only in 1932, in the meantime he had been able to improve considerably the accuracy of his measurements. Making a thorough discussion of all the possible causes of error, he calculated his final values, taking into account the various corrective terms. (P.R.S., 136, p. 428.) On many points he confirmed the observations of Bothe and Becker, and thus also the above theory about the internal structure of the nuclei of non-radioactive elements, in every point similar to that of the radioactive elements, except that in the case of the former, the probability for an α particle of escaping spontaneously from the nucleus, is practically nil. Webster also confirmed Bothe and Becker's discoveries on another important point, which was the beginning of a great discovery. Like them, he found that the energies of the γ radiations emitted from the different elements varied very widely, ranging from a few hundred thousand to several million e-v. However it was difficult to be very precise on this point, owing to the various corrections which had to be applied, as well as to the feeble intensity of the radiations observed. Beryllium and boron were found to emit γ radiations of very great penetrating power, in fact higher than that of any γ radiation known so far. Beryllium also was the element which emitted a relatively large amount of those radiations, so that researches on this element were somewhat easier and also more reliable.

For these very penetrating radiations, the above interpretation did not yield values quite in agreement with the experimental results.

In the meantime, I. Curie (daughter of the famous Mme. Curie) together with her husband F. Joliot, had taken up the experiments of Bothe and Becker, observing the emitted radiations by passing them through an ionisation chamber, mounted over a very sensitive Hoffmann electrometer (J. de. Phys., iv, p. 21). As α particles-source they used one of the most intense sources of polonium ever used so far: 100 millicuries, emitting some 2×10^6 α particles per second. A magnetic field could also be applied, normally to the axis of the cylindrical ionisation chamber. In this way they examined the radiations emitted by beryllium, boron, lithium, when bombarded with α particles. They first confirmed the discovery of the hard radiations: they found that the Po + Be radiation is only half absorbed by 4'5 cm. of lead, that of Po + B by 3 cm. They found the penetrating power to be intermediary between that of the ordinary γ radiations and that of the penetrating cosmic radiations. Hence the interest of the discovery: on one side it might throw some light on those mysterious cosmic rays, on the other side it tended to fill up a gap in the now very extended gamut of electro-magnetic radiations. The energy of these new radiations being so great I. Curie and Joliot thought that perhaps they would be powerful enough to produce transmutations in the lighter elements, just like α particles. Therefore they interposed on the path of those rays to the electrometer, screens of different substances. The idea was that in case of phenomena of transmutation, the particles, α or H, thus emitted from the nuclei would increase the ionisation in the chamber above the electrometer, this ionisation being added to that due to the γ radiations. They found on using screens of many different substances, such as Pb, Ag, Cu, Al, paraffine, that only a noticeable increase in the ionisation occurred when the substance interposed contained H atoms. In particular in the case of paraffine, they found that the ionisation current was doubled. By absorption methods and with the magnetic deflection method, it was easy enough to determine that the new ionising particle expelled by the photon from the paraffine was an H particle. However from this they did not conclude that some transmutation had taken place, since to produce H particles, it was necessary to put on the path of the radiations a substance containing already such H particles. It was then examined whether other nuclei could also be expelled

by this method. Experiments were made with helium first and then with other substances. It was found that in general all atomic nuclei are expelled by these penetrating Po + Be or Po + B radiations. The expansion chamber was used so that the phenomenon might be made visible. These experiments then showed clearly that the expulsion of nuclei is due not to an ionising corpuscle, for there was no luminous track of droplets from the top of the chamber up to the point where a short track is suddenly seen to start and which is due to the expelled proton or other nucleus. These tracks suggested the idea of an effect similar to that of the Compton effect: in the actual case, a γ radiation of great penetrating power, by impinging on an atom, would strike off an electron; the ejected particle whether H or α, or any other, would constitute the recoil atoms, whose ionising tracks were observed in the Wilson chamber. However the conclusions derived on this assumption seemed difficult to reconcile with the experimental results. Therefore Chadwick decided to examine in detail the properties of those radiations excited in beryllium. The ionisation current amplified by a series of valves, passed in an oscillograph, and gave then a deflection proportional to the ionising power of the expelled particles, which passed through the chamber. He definitely called these particles the recoil atoms, and observed them for different gases, thus confirming Curie's discovery that the radiation ejects particles presumably from all elements. From measurements of the energies of these expelled particles, he concluded that it is impossible to ascribe the ejection of these particles to a recoil from a quantum radiation, at least if energy and momentum are to be conserved in the collisions. Indeed he found that for the ejection of an H particle the radiation required should possess a quantum of energy of about 55 million e-v., for the ejection of a N particle 90 million, and thus larger and larger quanta as the mass of the struck atom increases. It should be remembered that Bothe and Becker had measured for the energy of the quantum a value of some 14 million, whilst Webster taking into account various corrections, concluded to a value still considerably lower. Chadwick had the genial idea of using a suggestion made by Rutherford in 1920 as to the possible existence of a neutron. From the above considerations he concluded that all the difficulties disappear, both with regard to frequency

and transfer of energy, if we suppose that the Po+Be radiation is not of electro-magnetic nature but is of corpuscular nature, consisting of particles of a mass nearly equal to that of the proton. To explain their great penetrability, which makes them so similar to γ rays, it is further necessary to assume that these particles have no net charge. We may suppose that such a particle is made up of a close combination of a proton and an electron, the 'neutron' as foreshadowed by Rutherford in his Bakerian lecture of 1920. The proton and electron are so closely combined that even in the immediate proximity of the particle, their respective charges cancel each other's effect. Such particles will of course be able to pass very close to the nuclei without being affected by the electric charge of those nuclei, hence like the photons they will have great penetrabilities. In the same way the ionisation they produce will be very small and thus is explained the fact that their path is not visible in the expansion chamber until they collide with a nucleus.

It is superfluous to expose more in detail the well-known researches of Chadwick, Feather, Dee and others on the neutron and its various properties, in particular its disintegrating powers, as clearly shown by Feather's photographs with the Wilson chamber. All this is too well known and also would not be directly to our point. It is however necessary to remark here that Bothe and Becker's suggestion as to the electro-magnetic nature of the radiation they discovered, in their experiments, is not to be abandoned, as might be concluded from the neutron theory. These same German scientists in 1932, succeeded in showing that with their detecting apparatus (a Geiger counter) the radiation they observed in the case of boron, was undoubtedly of electro-magnetic nature and must be connected with the two kinds of protons emitted by boron, as explained. In the case of beryllium, they admitted that the radiation observed by them, was mainly made up of neutrons. (Z. Phys. 76, p. 1616.) Later on they showed that by varying their experimental arrangements, they could at will measure either the neutrons or the γ radiations.

I. Curie and Joliot, besides confirming these conclusions (J. de Phys., iv, p. 278) observed that in the case of beryllium, the emission of neutrons is accompanied by very hard γ rays. From those observations Chadwick concluded that the emission of γ rays and neutrons are not independent and are probably

related in a manner similar to that in which the γ rays emitted by boron are related to the protons emitted at the same time, This supposition was confirmed by the experiments of I. Curie, Joliot and Savel (Comptes Rendus Acad. Sc. Paris, 194, p. 2208). They observed that the protons emitted from paraffine by the Po+Be radiation had different ranges, these could be separated mainly in a stronger group of range about 28 cm. and a weaker group of range 70 cm ; this corresponds to a maximum velocity for the neutrons of $2'9 \times 10^9$ cm/sec. and $3'8 \times 10^9$ cm./sec. respectively. The proposed explanation is that two kinds of disintegrations may take place : either there is emission from the Po+Be source of a neutron with the higher energy, or the transformation takes place in two steps, there being first the production of an excited nucleus with the emission of a neutron of lower energy and soon after the excited nucleus changes into the normal nucleus with an emission of a γ ray of energy corresponding to the change in energy. At the end of his discussion on this point, Chadwick concludes that the evidence now available is yet inconclusive. (P.R.S., 142, p. 1.)

The experiments on the artificial disintegrations with neutrons are of some interest for our subject, since here again the question of the emission of γ rays has been raised when more accurate observations became possible. It is in particular N. Feather who studied the collision of neutrons by stereoscopic photography of the tracks produced in an expansion chamber filled successively with different gases. His first studies went only to confirm the neutron theory, but after that he studied in detail the nature of the collisions. Of this he published a preliminary account (P.R.S., 142, p. 689) in November 1933, wherein he mainly states the data as obtained by direct experiment, without much discussion about the general problem of the nature of these collisions. There are however some explanatory suggestions in one of which, to obtain an exact balance of mass and energy in one kind of nuclear reactions, he requires the emission of a high energy γ radiation, accompanying such a disintegration.

We have already so often come across such a suggestion whenever more accurate measurements are at hand, that the extension of it to the case now considered, is quite natural, as Feather also concludes : 'experiment appears to show that the

emission of energy in the form of radiation is a feature common to the different types of capture disintegration of light nuclei'. However so far no good experimental evidence has been obtained in the present case.

The truth of Feather's remark can be seen in the case of quite another kind of artificial disintegration, initiated only of late by Cockroft and Walton, where the elements are bombarded by fast travelling protons. As Cockroft declared it (J. de Phys. iv, p. 421) the idea of such a method of disintegration could never have been thought of in the classical Quantum Mechanics, because according to this theory no sufficient energy could be communicated to a proton to make it cross the potential barrier of the nuclei. But with the ideas of Wave Mechanics applied to the atomic nucleus as done by Gamow, for a proton endowed with energy as can be communicated to it in our laboratories, there is still a certain probability of penetrating inside the nucleus, this probability increasing of course with the energy possessed by the proton. As is sufficiently known, artificial disintegrations were thus produced, just as with fast travelling α particles, since the discovery of the heavy isotope of hydrogen, even these diplons have been used to bombard elements and thus to disintegrate them. (P.R.S., 137, p. 229 ; 141, p. 259 and 141, p. 722). The interest of these experiments for our subject is that here again and quite naturally the question arose of possible γ rays emitted during these disintegration processes. Oliphant and Rutherford (P.R.S., 141, p. 274) having examined more in detail the transmutation of boron by fast protons, suggest that the B'' isotope on capturing a proton, breaks up into three α particles. This means a release of about 11 million e-v. of energy, whilst in their interpretation the total energy released is only some 9 million. There is then again the possibility of the surplus energy being emitted in the form of a γ radiation, the authors say that so far they had no time to search for it.

In their first report (P.R.S., 137, p. 229) Cockroft and Walton had already suggested an emission of such γ rays, to account for the short ranges which they found, when lithium is bombarded by protons. Later even Traubenberg claimed to have detected one γ ray quantum for each disintegration. However this is questioned by Oliphant, Rutherford and Kinsey (P.R.S., 141, p. 729).

More recently still, February 1934, Rutherford and Kempten (P.R.S., 143, p. 724) published a short study on the bombardment of the heavy isotope by α particles. These experiments were conducted to test whether the diplon can be broken up into a neutron and a proton, for this would reveal its internal constitution. No certain evidence has been obtained. It is remarkable that to interpret these negative results, another transformation was suggested in which one diplon would with two helions make three lithiums; here again, by considering the masses of the atoms, it was concluded that a liberation of some 3 million e-v. energy should take place, which, it was supposed, would be emitted in the form of γ rays. So far no evidence of such an emission has been obtained when heavy water is being bombarded with particles.

These last instances go at least to show how the idea of γ ray emission accompanying disintegration processes, has become quite familiar, and how its consideration helps much towards the understanding of the internal structure of the nuclei.

III. Anomalous Absorption of Hard Gamma Radiation

Besides the natural and artificial production of γ radiation accompanying nuclear disintegration, such radiations may also be produced without the destruction of the emitting nucleus. Already in 1921, Slater (Phil. Mag., 42, p. 904) claimed to have found a small amount of penetrating radiation from tin and lead bombarded with particles from radon. Subsequent attempts always failed to detect this phenomenon. In the meantime the subject was tackled along quite different lines, when researches on the absorption of γ rays led to the discovery of a new kind of nuclear γ radiation. To introduce our subject it will be useful to review some points concerning this absorption of γ rays.

Being of electro-magnetic nature and extremely small wavelength, the γ rays have a degree of penetrability much higher than the α or β rays. Their nature was investigated, as we have said, by means of the β ray spectrum they produce. However at first they were studied by means of their absorption coefficient, when passing through matter; in this way a first discrimination could be established between the γ radiations emitted by the different radioactive substances, for it was soon observed that

their respective powers of penetrability varied widely. Up to 1930, it was supposed that this absorption was due to two different phenomena only: the scattering or Compton effect and the photoelectric effect. γ rays are found to vary much in quality with the angle of scattering, which corresponds to the Compton effect in the case of X rays. On the other hand like X rays, γ rays manifest the photoelectric effect, in which process the whole energy of the quantum radiation is given to the electron which is emitted as a result of the impact of the photon on the atom. On the contrary in the first mentioned effect, only part of the energy of the quantum radiation is imparted to a recoiling electron, whilst the remaining part is emitted in the form of a γ radiation of smaller frequency. Hence the absorption coefficient of a γ radiation will be made up of three terms at least: two of which represent the conversion of radiating energy into corpuscular energy by the photoelectric and Compton effect respectively, and the third term represents the energy of the deflected radiation. However we shall usually speak only of two terms; $J + \sigma$, the first referring to the photoelectric effect, the other to the scattering effect.

For the ordinary X rays it was found that the photoelectric absorption coefficient per atom is proportional to the fourth power of the atomic number and the third power of the wavelength $J = C\ Z^4\lambda^3$. In the case of the γ radiations, no such simple relation has been found. With regard to the wavelength, it appears certain that the power of λ lies between two and three. L. H. Gray (Proc. Camb. Phil. Soc., 27, p. 103) found an empirical relation between the absorption coefficient and the wavelength, this relation is now universally used to obtain at least a probable value of the wavelength of the γ radiation which is being studied. Since the photoelectric absorption varies approximately as the fourth power of the atomic number, for the same radiation of a given wavelength, the absorption due to the photoelectric effect in a light element, say aluminium, will be negligible compared with that in a heavy element such as lead. This is the principle of the method for measuring the absorption coefficients. The absorption in aluminium giving practically the scattering coefficient, which being deducted from the value found in the case of lead, will give the photoelectric absorption coefficient for that radiation in lead.

The binding energy of the outer electrons being negligible in comparison with that of the incident quantum radiation, it is generally assumed that the scattering from each electron is independent of the atom to which the electron belongs. Hence it is usual to calculate the scattering coefficient per electron; this of course, when multiplied by the atomic number will be equal to the scattering per atom.

Like in the case of the photoelectric absorption, many attempts have been made to deduce a theoretical formula for the scattering coefficient per electron in the case of the γ rays. There was first the Compton formula, based on classical Mechanics, which was afterwards replaced by Dirac's formula based on the new Quantum Mechanics: both formulæ gave practically the same results. They were superseded by the Klein Nishina formula, which made use of Dirac's relativistic interpretation of Quantum Mechanics. Whilst in the case of the ordinary X rays, the three formulæ yield almost the same results, in the case of the γ rays, the latter formula gives values double those obtained by the other two formulæ. Hence the numerous experiments and observations to test the accuracy of the Klein Nishina formula. From what we have seen, it appears sufficiently how important it is to have a reliable formula to deduce from absorption measurements the wavelength of the various γ radiations which arise in nearly all the experiments on nuclear disintegration.

It should be noticed that the two ways mentioned in which part of the energy of the γ radiation is absorbed on passing through matter, refer only to interactions with the outer electrons of the atom, the nucleus not taking any part in it. We shall see how experiments to verify the accuracy of the Klein Nishina formula led to the conclusion that the nucleus may also be excited by γ rays and made to emit characteristic γ rays different from the incident rays.

Like several other researchers, G. P. Tarrant undertook to test the Klein Nishina formula and in 1930 he announced that the scattering coefficient as given by the Klein Nishina formula is accurate within the limits of precision of the experiments for a number of elements, yet for some other elements, especially the heavy elements, some abnormality was found in the absorption, which, he suggested, might be explained by an interaction

between the hard γ rays and the nuclei of these elements. (P.R.S., 128, p. 346.) Tarrant experimented with the γ rays from Thorium C″ using rather large filter thicknesses, only the hardest radiation, of energy $2'65 \times 10^6$ e-v., could traverse the filter, and thus the observation of the absorption referred practically only to this radiation. The γ rays were made to pass through small cylinders of different substances, and the amount of radiation transmitted was measured by means of an ionisation chamber placed directly above the absorbers and filters. Several measurements were made for each substance. A natural leakage had to be taken into account together with a small portion of the softer radiations from the ThC″, which were not absorbed, and also and chiefly the scattering correction, because some of the scattered rays will also enter the chamber, in spite of the small angle it subtends: separate experiments were made to find the value of all these corrections. Finally account had to be taken of a certain amount of photoelectric absorption, a probable value for this was calculated for the different substances and subtracted from the absorption coefficient as obtained from the experiments. It was found in this way that the absorption co-efficient per electron, which, as we have said, is assumed to be constant for all atoms, was different for the different substances. In Tarrant's first experiments, it was found to vary irregularly with the atomic number, however in general it was greater for the heavier elements.

We have seen that Tarrant had to calculate a probable value for the photoelectric absorption coefficient, since this coefficient for γ rays is not known with certainty, his calculations showed therefore some indefiniteness. This was one of the reasons why L. H. Gray, also at Cambridge and at the same time, decided to investigate more directly the scattering of hard γ rays (P.R.S., 128, p. 361). Contrary to Tarrant, Gray did not measure that part of the radiation which is simply transmitted through the absorber, but he measured the amount of radiation which was scattered by the absorber in directions making a given angle, namely between 16° and 90°, with the incident radiation. For this the ionisation chamber was of the annular type, so that the directly transmitted radiation passed through the inner cylinder without entering the chamber. In this case also he measured directly the scattering coefficient, without having to bring in

corrections for the photoelectric absorption. However to obtain sufficient intensity in the scattered radiation no source of ThC″ strong enough was available, so that Ra (B + C) was used. Experiments were made with aluminium and sulphur, a light and a heavy element. No certain difference in the scattering power per extra-nuclear electron could be observed. The results with lead were not very reliable, owing to large corrections to be applied for reabsorption. It must however be remarked that the γ radiations from Ra (B + C) are on the whole softer than those from ThC″, so that Gray's negative results led only to the conclusion that with γ rays from Ra (B + C) and within that degree of sensitivity as his experiments allowed, there is no difference in the scattering absorption per electron of light and heavy elements. Both Tarrant and Gray, at the end of their respective reports, announced that soon they hoped to obtain much more accurate results by means of an ionising chamber containing gas at a pressure of some 80 atmospheres.

Independently and almost simultaneously, experiments similar to those of Tarrant and Gray were reported by several researchers. Meitner and Hupfeld (Naturw., 18, p. 534) and Beck, arrived at the same conclusion as Tarrant. Chao (Phys. Rev., 36, p. 1519) besides reporting the observation of the anomalous scattering and its interpretation on the score of a nuclear interaction, mentioned that he had observed the emission of a secondary radiation, emitted by the elements, which show an anomalous scattering coefficient. He noted further that this radiation seemed to be almost monochromatic, and of the same quality in all directions, that is isotropic. Another observer, Jacobsen, like Gray, first reported negative results, but soon after, like Gray also, he corroborated the statement of the other researchers.

In the meantime Gray was studying the actually scattered γ rays in the forward direction, by means of a high pressure ionisation chamber, containing oxygen at a pressure of 85 atmospheres. In this way the ionisation due to the scattered γ rays traversing the chamber, was considerably increased, whilst on the contrary the disturbing effect of the ionisation due to the α particles markedly diminished. From the previous experiments it seemed now certain that in the case of the heavy elements there is a departure from the proportionality between

the scattering power of an atom and the number of its extra-nuclear electrons. This might be due either to the fact that the binding energy of these electrons has some influence on the scattering, or else that there is some nuclear reaction taking place, at least in the case of the harder γ rays. In the first assumption, that is the Compton scattering, as already noted, the greater the angle of scattering, the smaller the energy of the quantum radiation, hence in this process the greatest amount of energy will be radiated in the forward direction : nearly half the total energy scattered in this way falls within the angular range 10° to 30°, whilst only some 6% would be measured within the same range in the case of an isotropic radiation. If then the difference in absorption with different absorbers was due to the extranuclear electrons, by measuring the scattered radiation within the cited angular range for different scatters, a difference should be noted. Gray measured this for several elements, light as magnesium, aluminium, and heavy such as lead : no difference was perceptible either systematic or irregular. Hence the assumption that the scattering depends only on the number of extranuclear electrons can be kept. The other supposition, that of nuclear interaction, had now to be tested : owing to the greater sensitiveness of his ionisation chamber, Gray was able this time to take measurements for γ radiations from ThC″ as well as from Ra (B + C). However even with the actual improvements the ionisation due to the scattered γ rays from ThC″ was still so weak that it was of the same order as that due to the ' penetrating radiation ' ; this gives an idea of the precautions to be taken, besides the many corrective terms to be added. Such were the partial reabsorption of the scattered radiation, the absorption of the direct beam and of the radiation scattered from the walls of the lead cylinder which canalised the radiations from the source, after these had been filtered through a few cms. of lead. To calculate the values of these absorption coefficients, the author used the Klein Nishina formula for the scattering and the empirical photoelectric relation discovered by himself already referred to, which expresses the relation between the photoelectric atomic absorption coefficient and the wavelength of the radiation. In this way Gray observed and measured the relative scattering power per electron for different substances, especially for the hard γ rays from ThC″, and

less accurately for those from RaC. In the case of ThC″, he found a gradual increase of about 2% on passing from magnesium to lead, and an irregular decrease of the same amount in the case of RaC. From this he concluded that his empirical formula for the photoelectric absorption coefficient, could only account for part of the difference between the absorption coefficients of the hard γ rays from ThC″ in light and heavy elements. There seems therefore to be an additional absorbing mechanism besides the Compton scattering and the photoelectric effect, which is operative only in the case of very hard γ rays, such as those from ThC″. The author on discussing his results, concludes that the slight variation found, being only 1 or 2 %, although it is not probable, yet might possibly be attributed to some faulty estimation of corrections, such as those based on the empirical photoelectric relation. He concluded to the necessity of further investigations.

The researchers went on gathering more experimental data about this abnormal absorption and scattering of the hard γ rays. Thus Tarrant (P.R.S., 135, p. 223) measured the absorption coefficient for γ rays from ThC″ by means of a pressure ionisation chamber containing nitrogen at pressures between 100 and 120 atmospheres. As usual due account was taken of the different corrective terms, and finally the absorption coefficient per electron for different absorbers was compared with the results of other researchers. In general there was good agreement. It was found that on passing from the light to the heavy elements, these absorption coefficients vary quite closely as the square of the atomic numbers. Apart from the electronic scattering, there is the photoelectric absorption, and the supposed nuclear absorption. It is therefore the sum of these two last effects which was measured and found to vary approximately as the square of the atomic number. How each one separately varies is not known, because their effects cannot be separated. It was further noted that even in the case of light elements the scattering coefficient per electron as calculated by the Klein Nishina formula, is about 3 % less than the measured value. Hence the nuclear interaction with hard γ rays seems to be common to all elements.

In his report published in 1930 (Phys. Rev., 30, p. 1519) Chao had already noted that the anomalous scattered radiation

besides being isotropic is also almost monochromatic ; he found its wavelength to be about 22′5 X. U. (i.e. about $0'6 \times 10^6$ e-v.). In a discussion on penetrating radiations at the Royal Society in May 1932, Tarrant stated that the energies associated with the scattered radiation are about 1 and 0′5 million e-v., hence more complicated than what Chao had first observed.

In the case of the emission of a new radiation of wavelength different from the incident radiation, this is probably due to a disintegration or an excitation of the nucleus followed by the emission of one or more quanta radiations. It was therefore natural to search for the excitation or disintegration potentials of the various nuclei. The difficulty here was to find a source emitting γ rays of a continuous range of wavelengths. This was secured artificially by Chao, who used the scattered γ rays from the homogeneous hard γ rays from ThC″, falling on a light scatterer and thus by the ordinary Compton effect, giving scattered radiations varying continuously in wavelength with the angle of scattering. The incident beam of wavelength 4′7 X. U., gave in this way a range of wavelengths varying from 4′7 to 53′2 X. U. The greatest difficulty in this experiment was again the very weak intensity of the scattered radiation. However the difficulty was overcome by the use of a differential method, in which were compared the differences in the scattering coefficients per electron for a heavy and light element, the difference between the two he called the extra-absorption. In this way the errors were minimized. He found that on plotting the corrected values of these differences against the wavelength of the corresponding primary γ radiation, there was a sudden jump in the curve between 5′9 and 6′6 X. U. Hence there seems to be at this point an excitation or disintegration potential. This agrees well with Gray and Tarrant's results who found that in the case of RaC, the rays responsible for the nuclear scattering have a value of 2′2 and $2'5 \times 10^6$ e-v. However because of the error limits in Chao's experiments, the occurrence of a sudden jump was not quite conclusive and further investigation along this line was required.

Gray and Tarrant jointly investigated more in detail the secondary radiation emitted by various substances when irradiated with hard γ rays (P.R.S., 136, p. 662). They arranged their experiment in such a way that the secondary radiations reaching

the ionisation chamber, proceeded from the radiators in a direction making an angle 125° + 15° or 145° + 15° with that of the primary radiation. In this way the disturbing effect of the ordinary Compton radiation was much reduced. The calculations made were based on the assumption that the secondary radiation is spacially isotropic : the actual experiments together with previous experiments of Gray and of other researchers, showed that this is very probable. The experiments were carried out with the hard γ rays from Th″C, and Ra (B + C), the radiator specially studied was lead. Experiments were also made where the radiator was tin, iron or water in a glass vessel. It was found that in all cases the two same kinds of secondary radiations (about 0′92 and 0′47 million e-v.) were emitted by the various radiators, when irradiated with γ radiations of quantum energy greater than 1′8 million e-v. (λ = 7 X.U.) This was obtained from an accurate study of the effect with the Ra (B + C) radiations, in good agreement with Chao's results obtained by a quite different method, which was explained above. A third method, different from these two, also led to the same lower limit. This last method consisted in comparing the absolute number of quanta of the various γ radiations emitted per second by ThC″ and RaC of equivalent activity. In the case of Th″C only the hard radiations are effective and these constitute one-third of the total number of quanta. However these radiations produce an effect 2′2 times stronger than that from RaC, hence only about one-seventh of the total number of quanta from RaC is effective. On inspecting the numbers of quanta of the various γ radiations from RaC, it was found that no radiations of energy quantum below 1′8 million e-v. could be effective, otherwise more than one-seventh of the total incident radiation would have been effective.

Another interesting question was to investigate the magnitude of the reemitted radiation, in particular from lead. For this the unfiltered intensity of the irradiating hard rays was measured from the ionisation they produce after passing through a given thickness of lead, knowing the absorption coefficient of these radiations. Assuming that the secondary radiation is emitted isotropically, the integrated energy of the radiation emitted by one nucleus, could be calculated and compared with that of the incident radiation producing it. The ratio

of the two in the case of γ radiations from ThC″ was measured for several elements. Whilst at first it was found to be only about 0′52, in later and more accurate experiments (P.R.S., 143, p. 708), the authors found that within 10 to 15 per cent, the whole of the incident energy absorbed by the nucleus was reemitted in the form of secondary radiations. Since the main part of it are radiations of energy rather less than 0′5 million e-v., it follows that in general from four to six quanta of low energy radiations are emitted for each quantum of high energy absorbed. However whilst the total energy reradiated, like the abnormal absorption itself, varies approximately like the square of the atomic number, the proportion of the harder rays decreases much more rapidly with the atomic number. The theoretical interpretation of these results, suggested at that time by Gray and Tarrant, was that these secondary radiations are characteristic of the emitting nucleus. Following the analogy of electronic transitions in the outer structure of the atom, to explain the ordinary radiations, they suggested that here also when radiation of energy quantum higher than 1′8 million e-v. falls on the nucleus, a certain number of particles in the nucleus are in an excited state. The transitions of each particle separately to the ground state, corresponds to the emission of a γ radiation of 0′5 million e-v. The simultaneous transition of two particles will correspond to the emission of a one million e-v. radiation, this however will be a much rarer event than the first case, whilst there is hardly any likelihood for a simultaneus transition of 3 particles, which would give a 1′5 million e-v. radiation, hence it is never observed. There still remains an excess of energy of about 0′5 million e-v., how this is disposed of by the nucleus, cannot be explained yet, but probably it is not emitted in the form of γ radiation, because its effect would have been observed.

It had been suggested by Meitner and Hupfeld (Naturw., 19, p. 775) that the secondary emission might perhaps consist merely of part of the unmodified γ radiation simply transmitted, mixed with some γ radiation scattered according to the ordinary Compton law. Such a mixture would in fact explain the results deduced from their experiments. Gray and Tarrant undertook to examine this question, by a special series of experiments and they arrived at the conclusion that very little if any of the primary radiation is present in the secondary emission from lead.

At most this could account for 2 per cent of the total intensity of the secondary radiation.

The same conclusion was arrived at by Ketelaar and Stahel (*J. de Phys.* iv, p. 457), they proved by their experiments in an unambiguous manner that the radiation emitted by the radiators is characteristic of the irradiated substance and is markedly softer than the primary γ radiation. In general the results of their experiments agreed with those of Gray and Tarrant, whose experimental arrangement they followed approximately, they were however to add some precisions on a few points. In the case of lead, by studying in detail the shape of the absorption curve of the secondary radiation, they found that the hard radiation of $\lambda = 16'7$ X.U., as mentioned above, is approximately isotropic at least with regard to the energy, but with regard to the total energy, there seems to be a greater amount emitted in the direction closer to that of the primary radiations. The total integrated energy of the hard component being about 1/5 of the energy of the secondary radiation taken as a whole. There is another softer component of $\lambda = 31'2$ U.X., representing about 45 per cent of the total, and then there remains another 35 per cent which may possibly be ascribed to the ordinary Compton scattered radiation. The wavelengths of the secondary radiation were also studied in detail for other radiators than lead, and contrary to Gray and Tarrant's results, it was found that the hardness of this radiation was increasing with the atomic number of the radiators. Thus for Al, the inclination of the absorption curve for the secondary radiation was hardly less than that for the ordinary Compton radiation ($\lambda = 32$ and $41'9$ X.U. respectively). As the atomic number increases, the slope of the corresponding absorption curve gradually becomes less steep. In the case of iron the corresponding wavelength was found to be $23'4$, for tin $21'9$, for lead $16'7$, for uranium $18'6$. This with regard to the quality, or wavelength of the secondary radiation, if however we consider the total energy of the secondary radiation, then it is found to decrease with increasing atomic number. This is easily understood, since the greater the atomic number, the greater the portion of this secondary radiation which will be reabsorbed in the radiator itself. This last point led to an interesting modification in the method of experimenting: in fact it was found that on starting with very thin radiators and then

gradually increasing the thickness, the intensity of the diffused radiation at first increases proportionally to the thickness, but for the greater thicknesses, the intensity tends towards a limit, because the radiations emitted at a certain depth, are practically fully reabsorbed before reaching the surface. It was noticed besides, as could be expected, that for increasing thicknesses the proportion of the hard component was increasing. Hence the idea of using very thin radiators so as to find the real proportion of hard and soft components emitted by each nucleus. By means of a simple theory and subsequent experiments, the conclusion was thus arrived at that in the case of lead the ratio of the initial energies of the soft and hard components is 4'5 whilst for great thicknesses, when saturation is reached, it is only 2'25. The authors therefore concluded that for each hard quantum, about eight soft quanta are emitted.

Quite recently Gray and Tarrant published the results of their latest experiments (P.R.S., 143, p. 681), which consisted for a great part in obtaining confirmatory evidence for their previous results and those of other reasearchers. At times also they concluded to the necessity of altering their previous results, because some points had been overlooked, this was the case for the measurements concerning the fraction of the γ rays' energy absorbed by the nucleus and reemitted, as we have mentioned it. They arrived at these results from an accurate study of all the corrective terms to be applied and of all the details of the experimental procedure so that definite conclusions might be reached as to the reliability of experimental data and the theoretical interpretation thereof. They discussed in particular the various absorption curves of the secondary radiation emitted by the different radiators. These curves could be decomposed into several straight lines corresponding to various radiations, of which the complex secondary radiation was made up. The authors showed that a very great degree of certitude concerning the energy of the component radiations obtained in this way, could not be expected. In the case of the primary radiation from RaC, they even showed that the curve could be very well interpreted by assuming besides the two ordinary components, a third softer one. In general however the results seem to conclude to the same energy for the hardest secondary radiation, of which however the total energy decreases rapidly with decreasing atomic

number. With regard to the softer component, there are slight variations with the different radiators, chiefly when the primary radiation is from RaC. However no regular variation was found as in the case of Stahel and Ketelaar's experiments.

Since the theoretical explanations proposed so far, are not quite satisfactory, as we shall soon explain, the authors examined the question whether those secondary radiations were really of electro-magnetic nature and not particles. For this they measured the ionisation produced separately by the hard and soft components in nitrogen and hydrogen and found the ratio of the two to be 4'5 which is practically the value obtained with γ rays of the same wavelength, whilst in the case of neutrons the ratio is 0'3. They experimented also with a Wilson chamber: the photographs failed to indicate the presence of any radiation other than the γ radiations as explained.

Additional evidence was also obtained concerning the isotropic distribution of the secondary radiation. By this time the radiation had been measured almost in all possible directions by various researchers. The authors undertook some additional measurements on the angular distribution of the radiation between 64° and 114°. Although each experiment taken separately is liable to considerable experimental error, when taken together the various experiments afford sufficient evidence for the conclusion of an approximately isotropic distribution, as had already been stated by Chao in 1930.

From the accurate and in general concordant results obtained so far by themselves and by other researchers, the authors conclude that it is not possible to hold the theoretical interpretation suggested by themselves as well as by several others, which interpretation assumes that the nucleus first excited by the primary radiation, on returning to its stable state, emits the characteristic radiations. It is concluded that if this were so, in case the excitation is produced by a quantum of energy higher than the critical excitation potential (about 2 million e-v.), the surplus should be emitted in the form of a Raman scattered radiation. We have seen that secondary radiations are produced by the hard γ rays from ThC″ and RaC of mean energy values 2'6 to 2 and 2'2 to 2 million e-v. respectively. Hence there should in each case be a different scattered Raman radiation. It might be suggested that in the case of ThC″ this corresponds to the softer

component and in the case of RaC, to the third and softest component of energy 0'3 million e-v. But the theory of the Raman effect requires only a very weak emission of this scattered radiation : about 0'2 to 2'6 or 8 per cent of the emission. Whilst in fact at least for the soft component from ThC″, this radiation represents nearly half of the total emission. Another interpretation is therefore suggested, which was first proposed by Blackett and Occhialini, immediately after the discovery of the positive electron in connection with cosmic radiations. It was soon after found by several researchers that such positive electrons are also emitted by lead and other substances when irradiated with the hard γ rays from ThC″. It is therefore natural to look for a connection between this emission of positive electrons and the abnormal absorption of hard γ rays accompanied by the emission of a secondary radiation. A tentative explanation based on this, is proposed by Gray and Tarrant, but already before them a more detailed interpretation along similar lines was proposed by I. Curie and Joliot (J. de Phys., iv, p. 494). These last authors had observed that the distribution curve of the energies of the positive electrons emitted from lead bombarded with the hard γ rays from Th C″, shows a sudden diminution at about 0'8 million e-v. On many of the photos taken with the Wilson chamber, they found paired tracks, one corresponding to a positive electron, the other to a negative one ; at times even both tracks were seen to start from the same point. They suggested that one quantum radiation of high energy, on meeting a heavy nucleus, is transformed or rather ' materialized ' into two electrons of opposite sign. This materialization of course will require an expense of energy, found to correspond to about 1'02 million e-v. What is left of the initial quantum energy, is communicated to the electrons as kinetic energy, and perhaps also part of it might be emitted as a diffused quantum. In the case of the 2'65 million e-v. incident quantum, a couple of electrons, of opposite sign will be emitted having kinetic energies of about 0'8 million e-v., as found experimentally. It follows also from this that at any rate no radiation of quantum less than 1'02 million e-v. can produce positive electrons, since so much is required for the materialization alone. This last conclusion agrees with the observation of Gentner that the abnormal absorption of γ rays becomes noticeable for radiations

of energy above 1'1 million e-v. In these transformations the nucleus itself does not seem to take any part, except in so far that its presence is indispensable, almost like a catalyst in some chemical reactions. This suggestion will of course have to be submitted to experimental tests, to be verified quantitatively in all its consequences.

The great difficulty in the above explanation, is that the secondary radiation in the case of abnormal absorption, is, at least mainly, of electro-magnetic nature. Perhaps the hypothesis of Gray and Tarrant may explain this, since according to them the primary rays, on being absorbed, are transformed into positive electrons, which in their turn soon after are annihilated with a negative electron in free space, and, as a result of this, two quanta are produced of about half a million e-v. each, as found for the soft component. Or also, but more rarely, the positive electron may become annihilated in such a way that a massive particle, say the nucleus, carries away the recoil momentum ; in this case it can be shown that a quantum radiation corresponding to that of the hard component is emitted. However Gray and Tarrant find that such a hypothesis encounters a number of difficulties when confronted with experimental data. Perhaps, a combination of both the above explained theories will have to be considered.

Like in our study of the spontaneous and artificial disintegrations, we arrive once more at the same conclusion, that the experiments of the last years have thrown much light on what is going on inside the atomic nucleus. It will require a certain time and much painstaking work to explore the newly discovered field. Then only will it be possible to obtain a coherent view of the whole. Once this reached, it will of course lead on to further inquiries and discoveries. This unending process seems to be a characteristic feature of scientific research, and quite naturally so, since we know the natural phenomena only from the outside, from the way they appear to us, and not as they are in themselves.

ECONOMIC DEPRESSION IN THE MADRAS PRESIDENCY (1820-1854)

'Long lines of cliff breaking have left a chasm:
And in the chasm are foam and yellow sands.'

—TENNYSON.

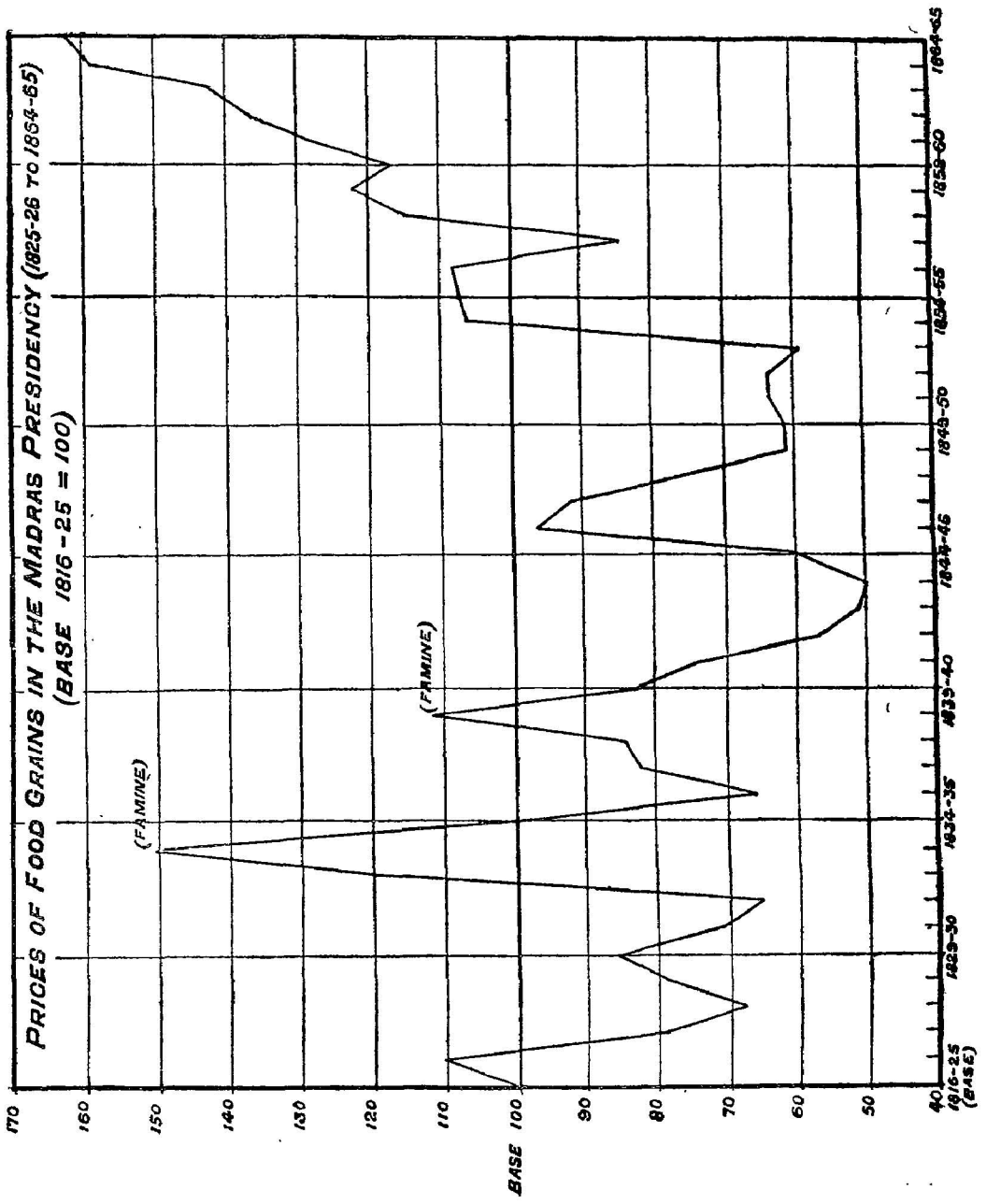
I

Exactly a hundred years ago, there was an economic depression of great magnitude in India. It commenced about the year 1820 and continued its chequered course till about 1854. It seems to have prevailed in all parts of India, but was perhaps most pronounced in the ryotwari provinces of Madras and Bombay. Madras Presidency was formed in the early years of the 19th century, and soon afterwards it found itself in the grip of a fell slump which seriously affected public and private economy and produced a great deal of suffering all over the Presidency. The following index numbers were constructed by taking into account the prices of foodgrains [paddy (2 sorts), cholam, ragi, varagu, and cumbu], with the period 1816-25 as the base:—

Years	Average Price per Madras Garce in Rs.				Index Nos.	
	Paddy 1st sort.	Cholam	Ragi	Cumbu		
1816-25 Base	111·1	137·5	114·4	111·1	**100**	
1825-26	122·6	152·2	130·0	124·0	**110**	
1826-27	92·5	103·0	91·8	87·0	**79**	
1827-28	80·6	84·6	78·5	77·0	**68**	
1828-29	92·3	105·3	89·6	86·8	**79**	
1829-30	97·3	109·5	100·6	99·8	**85**	
1830-31	83·0	99·5	75·6	82·0	**71**	
1831-32	71·8	85·8	74·0	72·5	**65**	
1832-33	120·7	171·3	146·5	154·1	**120**	(Famine)
1833-34	156·2	203	174·5	177·3	**150**	(Famine)
1834-35	99·7	122·7	113·5	124·5	**98**	

Years	Average Price per Madras Garce in Rs.				Index No.	
	Paddy 1st sort.	Cholam	Ragi	Cumbu		
1835–36	80·4	87·8	80·4	74·5	**66**	
1836–37	97·8	111·6	103·0	95·8	**83**	
1837–38	98·5	113·1	109·8	95·1	**84**	
1838–39	122·6	153·5	125·8	126·0	**111**	(Famine)
1839–40	97·4	110·6	102·6	86·8	**82**	
1840–41	85·1	100·2	85·8	80·6	**74**	
1841–42	63·8	70·7	67·3	63·4	**56**	
1842–43	67·6	61·7	66·2	57·1	**51**	
1843–44	67·0	60·0	66·3	55·7	**50**	
1844–45	76·9	78·4	80·4	64·0	**60**	
1845–46	110·7	128·7	121·3	119·1	**96**	
1846–47	106·5	125·7	117·0	121·2	**91**	
1847–48	79·6	110·8	96·7	92·2	**76**	
1848–49	72·3	82·4	77·0	68·4	**61**	
1849–50	75·5	81·2	74·2	75·7	**61**	
1850–51	70·6	86·5	68·8	76·4	**63**	
1851–52	68·7	83·8	66·8	71·2	**60**	
1852–53	68·7	85·0	67·5	74·1	**60**	
1853–54	111·7	151·0	123·8	127·3	**106**	
1854–55	119·8	146·8	125·7	122·5	**107**	
1846–55 (10 years)	88·5	106·7	97·5	94·3	**81·3**	
1856–65 (10 years)	143·7	165·1	158·4	146·3	**121·5**	

Between 1825 and 1854, prices were constantly on the decline; but the most acute fall occurred during the period 1840-45 when the index number stood at 58.20, thus recording a fall of 41.80 per cent from the basic period. The year-to-year variations of prices shown above are much larger than we are accustomed to in modern times, but that must have been chiefly due to the lack of communications and the caprices of


PRICES OF FOOD GRAINS IN THE MADRAS PRESIDENCY (1825-26 TO 1864-65)
(BASE 1816-25 = 100)
(FAMINE)
(FAMINE)
BASE 100
170
160
150
140
130
120
110
100
90
80
70
60
50
40
1816-25 (BASE)
1825-30
1830-35
1835-40
1840-45
1845-50
1850-55
1855-60
1860-65

weather. These circumstances have changed since, owing to the growth of irrigation and cheapening of transport.

In many ways, the depression of 1820-54 is analogous to the recent price slump which commenced in 1920 and is still continuing. The analogy is perhaps least in regard to causes, and greatest in regard to course and effects. Both depressions embarrassed Government by reducing revenue and disorganising trade; agriculture suffered most under both and the agriculturist's burdens increased, owing to the rigidity of his dues—revenue, rent, interest, and other fixed charges. It was to combat the depression of 1820-50 that Government slightly modified its laissez-faire policy and interested itself in irrigation and road-making and agricultural improvement; the burdens of the tax-payer were also lightened by a more liberal policy of land revenue settlement. Indeed conditions have largely changed in the last 100 years; none the less the experiences of the depression of 1820-50 must be of some value in combating the present depression.

Although this was perhaps the greatest depression of the 19th century in India, the attention of economists has not been sufficiently directed to this important event in Indian economic history. In fact, the only information available to the student is contained in two or three paragraphs in Mr. Srinivasaraghava Aiyangar's able *Memorandum on the Progress of the Madras Presidency during the last* 40 *years* (1892), and in a short note by Peddar. Lately, the original documents connected with the subject have been explored and a work is being prepared by us. In this paper, it is only proposed to enquire into the causes of the depression.

II

Causes of the Slump

Mr. Srinivasaraghava Aiyangar attributed the depression of 1820-54 to local causes, as he did not realize that the depression was not confined to India. It prevailed in England and over all Western Europe and was one of those secular price movements which affect nearly the whole world. Ever since the influx of American silver into Europe in the 16th century, there have been several long-period movements of prices in Europe, and as different parts of the world have

become connected by trade, these movements transmitted themselves to distant parts of the world.

Thus, even in the 16th and 17th centuries, when India's connection with Europe was far from intimate, prices in India rose simultaneously with prices in Europe, and it is said that the successive enhancements of the Moghul land revenue were due to these increased prices.[1]

Without entering into the still unsettled controversy on the cause of trade cycles, it may be said that in those days, at any rate, monetary causes were more potent than non-monetary. In recent times, the relation between gold and prices has become rather remote, but in the 19th century and to a larger extent in the previous centuries, the relation between prices and the precious metals had been much more direct. As credit had not developed in those days and as even paper money was scantily used, money then meant the metallic circulating medium.

Writing about the depression of 1820-50 in Europe, Sir Walter Layton, who has carefully analysed these secular price movements, says: 'Prior to 1810, Europe had received the greater part of its supply from the Spanish colonies of Central and S. America. But during the wars of the French Revolution the colonies threw off the yoke of Spain and 15 years of civil war and internal disorder followed during which period the mines were practically deserted and a great slump occurred in the output of the precious metals'.[2] According to the estimates of Del Mar, the output of gold and silver from Spanish America which amounted to £7,200,000 a year before the French Revolutionary wars, fell to £5 million in 1825 and £4 million in 1829; and this was the potent cause of the depression in Europe.[3]

The scarcity of precious metals affected India even as it affected Europe. As India did not have any considerable local supply of gold or silver, she had to get both the metals from outside, and what affected their supply outside affected the supply in India as well. In those days, as now, a general fall of prices meant a diminution in the supply of money or an increase in the demand for it or both. After 1800, the

[1] *Fifth Report*, Vol. II, p. 186 (1883 Edition).
[2] Layton, *An Introduction to the Study of Prices*, p. 38.
[3] Del Mar, *History of the Precious Metals*, chapter xviii.

supply of money in India diminished owing to various causes, while the demand for money increased considerably. We will see how this happened.

III

Supply of Money

The supply of money during the period diminished owing to (1) the outflow of bullion, and (2) to the Indian Currency Act of 1835, which resulted in the demonetization of gold and the discarding of a good deal of the silver currency.

India has always been regarded as the sink of precious metals. That was because she always had valuable merchandise to sell to other countries, but had little to buy from them, thus necessitating payment in bullion. This disturbed the minds of the financiers of the Roman Empire, and the drain of specie to India is generally regarded as one of the chief causes of Rome's downfall. Early European traders had the same experience. Sir Thomas Roe expressed it in the epigram, 'Europe bleedeth to enrich Asia'[1]. Hence the stringent regulation of the export of bullion to India from European countries. In England laws already existed against the exportation of coin and bullion, and in the time of James I, this was regarded as so heinous an offence against the country that the king found himself helpless in raising revenue by selling pardons.[2] Indeed subsequently, such bullionist ideas changed in England and in the first half of the 18th century bullion formed 75 per cent of the total imports of the Company into India. However, when the Company acquired territorial possessions in India, bullion exports to India became unnecessary, and even the Company's trade with China came to be managed with Indian bullion.

Thus the current changed. India which absorbed bullion for centuries had to disgorge part of it. This is what repeatedly happened in the past and one is even tempted to formulate a law of bullion movements. For centuries, India would absorb gold and silver; and then would come an efflux which would partly deplete the hoards. Such a rhythmic movement is observable in the bullion transactions of India from the earliest times to the present day, and it is curious to note that generally

[1] Quoted in Moreland, *From Akbar to Aurangzeb*, p. 53.
[2] See H. M. Robertson, *Rise of Economic Individualism*. (1933), p. 62.

the outflow of gold occurred when there was a shortage for it in Europe. During the 16th and 17th centuries, the flow was inward, but after 1757, the outflow commenced, and this became pronounced in the first three decades of the 19th century, but it diminished after 1840. When the Company became an important territorial power in India as a result of the battle of Plassey, it obtained large revenues from its possessions. Handsome gifts and tributes were also made by the country powers to the Company and to its servants. Several of the Company's employees made large fortunes: Bolts admits having made £90,000 in six years. The Company had also to meet large dues in England, and this it did, not only by sending merchandise but by exporting bullion and specie. Bullion from India was also transported to China for the 'investments' of the Company there, and that bullion never returned to this country. The result was that, year after year, not only bullion but coin went out of the country and the amount of currency in circulation diminished. Indeed this could have been avoided by the use of bills of exchange, and bills were known and used then in India not only by the Company, but by Indian bankers also; but owing to various circumstances, they could be used only to a limited extent.[1] From the very beginning the Company realized the economic evils of such a growing drain of coin from the country, but they were unable to remedy it for a long time.

The declining importance of India's staple exports also contributed to the efflux of bullion from the country. When the European nations first traded with India, the principal articles of Indian export trade were pepper and calico, and these two constituted the great bulk of the homeward cargo.[2] But towards the close of the 18th century, both these exports declined in quantity and value. The demand for pepper diminished because thanks to the agricultural improvements of 'Turnip' Townsend and Jethro Tull, it became possible to keep cattle during winter with the new fodder crops, and the system of killing and pickling beef and mutton in autumn thus died away, and with it the importance of pepper also passed away. As for the trade in calico, Great Britain transformed herself about the beginning of the 19th century from an importer of

[1] Parshad, *Indian Foreign Trade*, pp. 57–58.
[2] Thomas, *Mercantilism and East India Trade*, Chapter I.

cotton textiles to an exporter—and the principal exporter—of that commodity, and this was the result of the Industrial Revolution. The spinning jenny and the power loom cheapened the processes of spinning and weaving cotton in England, and enabled her to become the home of the world's cotton industry, and not only did England capture the market in Europe but soon her cheap calicoes and muslins came into India and successfully competed with the hand-made and expensive calicoes and muslins of this country. Indeed the high tariffs imposed on Indian textiles in England also hastened the decline of Indian exports, but that decline was bound to come by the superiority of the machine over the human hand.

In this way, the character of Indian export trade, which remained fairly steady for at least a thousand years, underwent a radical change, and dwindled in quantity as well as value for some time. The textile exports diminished after 1800, and their fall was rapid after 1820. In the last decade of the 18th century, cotton goods worth £2 millions on an average were exported to England, but in the decade 1820-30, the exports came only to £500,000 on an average and in the following decade fell below £300,000.[1] The Charter Act of 1833 gave a fillip to the importation of English textiles into India, and after that, the textile exports of India died away rapidly.

So long as the East India Company carried on trade, there was some encouragement given to Indian manufacturers, owing to its annual 'investments', but that ceased when the Company's trading rights ceased. Subsequently, there arose a growing export trade from India in primary products, but that involved a radical change in the nature and direction of Indian trade. Partly owing to this change and partly to other causes, the imports of bullion diminished for a time, and from some parts of India there was a large net exportation of bullion and specie. To facilitate the efflux of treasure, the Government of England permitted the transportation of bullion belonging to the Company's Governments in India in H. M.'s ships at the same rates as those paid for the transport of treasure belonging to the Crown.[2]

[1] McGregor, *Commercial Tariffs*, Digest Vol. IV, pp. 434-40.
[2] Despatch of the Court of Directors to Madras, (Finance)10 April 1838, No. 4.

Unfortunately, we have not got accurate statistics of the export and import of bullion during the period. The figures given by authors are often based on guesswork. However, we have enough to conclude that much more bullion was exported than imported during this period. Sir George Wingate has estimated the efflux of bullion from India during the period 1800-1858 at £100 millions, and Montgomery Martin, reckoning at compound interest, computed the outflow of bullion in the period, 1800-1830, at £700 millions. Sir John Shore and M. E. Grant have not given figures but hold that the amount was large. Professors Hamilton and Dodwell consider these estimates exaggerated, but have not given any specific counter-estimates. Hamilton pushed the scepticism furthest, and Dodwell doubted 'whether he (Hamilton) allows quite enough weight to the popular belief as displayed by Shore and Grant'.[1]

IV

Supply of money—the Peculiar Features of Madras

The general view of Indian trade and bullion movements dealt with above is fully borne out by the experiences of Madras in the period, 1820-54. Nay, more. Various peculiar features of the trade of this Presidency aggravated the causes of the bullion outflow and prolonged it more than in other presidencies. We have been able to gather from Madras archives fairly adequate statistics of the trade and bullion movements of the period and we find that the outflow of bullion which commenced from the year 1825 continued almost uninterruptedly till 1850.

The special features which intensified and prolonged the outflow of bullion may now be dealt with: In the first place, during the period under survey the export trade of Madras changed drastically both in content and destination. Until about 1830, the export trade of Madras was chiefly in manufactured textiles and this went to those countries which generally paid for our goods in bullion (e.g., Straits of Malacca, West Coast of Sumatra, Manilla, Pegu, Persian

[1] *Journal of Indian Economics*, 1921-22, p. 236.

Gulf and Arabia); and those countries were the most regular source of supply of precious metals for the Madras Mint.[1] But when cheap British textiles outsold the Indian piecegoods in those countries the export trade rapidly fell away and bullion ceased to flow into the Presidency. Indeed, our export trade with China and Britain increased, but they did not send us bullion and this was partly due to the bill transactions of the Court of Directors which will be dealt with below. The following tables will bring out the change in the Export trade both in character and destination between 1824-34 and 1840-50.

STATEMENT SHOWING AVERAGE ANNUAL EXPORTS OF MERCHANDISE FROM MADRAS BETWEEN THE YEARS 1824–34 AND 1840–50

[Compiled from the Mint Master's Reports.]

Countries	1824–34 (average of 10 years)		1840–50 (average of 10 years)	
	Piecegoods Rs.	Total Rs.	Piecegoods Rs.	Total Rs.
Straits of Malacca ...	14,58,488	16,13,512	7,60,994	10,22,264
West coast of Sumatra ...	1,43,373	1,59,102	5,329	8,213
Manilla	1,70,644	1,72,899	*Nil*	*Nil*
Pegu	1,35,000	2,75,000	1,10,000	Little decline
Gulf of Persia, and Arabia	5,46,000	13,70,000	1,68,000	12,00,000
China	,,	6,50,000	,,	14,50,000
Great Britain ...	16,00,000	29,75,000	5,75,000	50,00,000
Bengal	2,00,000	9,00,000	4,75,000	14,75,000
Bombay	*12,50,000*	*50,00,000*	*9,75,000*	*73,00,000*
Ceylon	6,75,000	14,50,000	7,50,000	29,75,000

During this period the export trade of Madras in manufactured goods diminished by about 40 per cent while the

[1] Mint Master's Report, 16th December 1851, para 17.

export of primary products increased largely, as will be clear from the table below.

AGGREGATE EXPORTS FROM MADRAS DURING THE DECENNIAL PERIODS 1824—34 and 1840—50.

Articles.	From 1824—25 to 1833—34	From 1840—41 to 1849—50
Piecegoods	619,89,315	382,73,194
Cotton and cotton wool ...	82,45,741	426,93,304
Grain	239,42,294	377,96,556
Sandalwood	23,18,755	12,29,660
Spices	86,50,691	111,68,595
Sugar	*Nil*	95,73,161
Oils	*Nil*	6,77,141
Oilseeds	*Nil*	2,44,363
Dyes, indigo, etc.	70,90,670	216,52,303
Turmeric	*Nil*	3,68,614
Coffee	3,29,043	18,44,784
Salt	17,47,514	12,66,079
Hides	3,42,830	19,14,624

Evidently the void created by the decline in manufactured goods was more than filled by the growing export trade in raw materials. This subsequently increased to much larger proportions until nearly the whole of our exports became primary products. The outflow of bullion from Madras was an inevitable result of this transition from an export trade composed chiefly of finished goods to one mainly of primary products. And naturally the transition was a painful one and it dislocated the price level and caused one of the greatest economic depressions ever known in the country.

2. It may be asked why the increased export trade with China and Great Britain did not result in an influx of bullion into the Presidency. But here we have to explain another important factor which made bullion movements unfavourable to Madras. When money was due to the Presidency from Britain or China or other countries which were Britain's

debtors, the Court of Directors settled such accounts by means of bills drawn on the Indian treasuries. The result was that bullion which ought otherwise to have found its way to India in the natural course of commerce was prevented from coming in. The first large issue of Company's bills began in 1834 but its importance rapidly increased as can be seen below:

AVERAGE VALUE OF BILLS DRAWN BY COURT OF DIRECTORS FOR THE 5 YEARS ENDING

	Rs.
1834—35	31,610
1839—40	14,31,685
1844—45	13,87,586
1849—50	39,21,580

3. There were also various political causes tending to work in the same direction. 'The employment of our troops in foreign warfare, their maintenance in time of peace beyond its frontier, and the necessary contribution of this Presidency to the general charges of the empire have constantly required the export of large sums on the public account, far in excess of the imports'.[1] For instance, Madras sent a considerable amount of specie to Malacca in 1832 for the payment of the Company's troops there; expeditions to Burma and China were also financed by sending specie from Madras.[2] Another political factor was the arrangement under which the revenues of Malabar and Canara amounting annually to Rs. 20 lacs on an average were sent directly to Bombay in the form of specie. According to a contemporary estimate the net export on Government account alone for the 30 years from 1820-21 to 1849-50 amounted nearly to Rs. 15 crores. The cumulative effect of all the factors described above was the pronounced and prolonged outflow of specie as may be seen from the following table carefully drawn up from the documents preserved in the Madras Record Office.

[1] Selections from the Records of the Madras Government. No. III of 1854, p. 82. Para 7.

[2] Despatch of the Court of Directors, 10th August, 1836. No. 11 (Finance; see also *Calcutta Review*, Vol. XVI (1851), pp. 473-74.

STATEMENT OF BULLION AND SPECIE IMPORTED INTO AND EXPORTED FROM MADRAS PRESIDENCY DURING THE YEARS 1819–20 TO 1849–50.

YEARS.	ON PRIVATE ACCOUNT.		ON GOVERNMENT ACCOUNT.		TOTAL.	
	Imports. Lakhs.	Exports. Lakhs.	Imports. Lakhs.	Exports. Lakhs.	Imports. Rs.	Exports. Rs.
1819–20	...	...	...	...	78,29,021	36,90,066
1820–21	...	...	...	...	43,69,643	27,28,191
1821–22	...	...	...	...	40,05,731	51,27,222
1822–23	42·80	2·72	*Nil*	27·00	42,80,641	29,72,596
1823–24	...	...	...	...	84,56,782	84,41,771
1824–25	44·90	4·42	23·31	79·76	68,21,445	84,18,825
1825–26	37·05	5·38	0·28	124·34	37,33,958	1,29,72,242
1826–27	32·74	8·98	11·21	50·04	43,95,076	59,02,914
1827–28	36·28	10·12	0·99	44·67	37,27,185	54,79,102
1828–29	26·31	9·91	*Nil*	47·69	26,31,476	57,60,109
1829–30	22·40	12·65	*Nil*	86·39	22,39,768	99,04,006
1830–31	20·39	7·85	*Nil*	25·70	20,39,237	33,55,028
1831–32	26·33	17·80	*Nil*	67·98	26,33,040	85,77,796
1832–33	25·43	26·93	1·44	31·88	26,86,649	58,81,220
1833–34	26·76	23·67	35·12	29·55	61,88,856	53,22,401
1834–35	33·42	11·06	*Nil*	17·59	33,42,091	28,65,642
1835–36	32·65	8·41	1·58	58·12	34,23,070	66,53,208
1836–37	33·28	8·49	12·35	48·97	45,63,525	57,46,898
1837–38	25·35	17·25	26·16	39·08	51,51,626	56,33,301
1838–39	35·28	15·66	6·52	48·74	41,80,785	64,40,920
1839–40	27·88	11·10	5·66	91·97	33,54,590	1,03,07,711
1840–41	30·32	10·02	10·00	95·40	40,32,845	1,05,41,605
1841–42	28·89	3·33	*Nil*	83·50	28,88,803	86,83,339
1842–43	28·68	2·82	*Nil*	71·19	28,68,744	74,01,161
1843–44	49·08	18·33	9·00	27·50	58,08,323	45,82,816
1844–45	65·43	7·42	*Nil*	70·40	65,43,643	77,82,901
1845–46	66·01	9·06	*Nil*	32·80	66,01,711	41,86,753
1846–47	49·60	31·30	*Nil*	29·30	49,60,828	60,60,098
1847–48	37·00	35·52	*Nil*	71·00	37,00,280	1,06,52,343
1848–49	26·75	22·38	*Nil*	77·00	26,74,852	99,38,403
1849–50	42·36	9·10	*Nil*	59·79	42,36,514	68,79,637

[Compiled from the Statements by the Collector of Customs, Madras, In Consultations dated 2nd August, 1832, and by the Reporter of External Commerce dated 23rd September, 1851, and from Reports of the Mint Committee.]

The Government of Madras at the time was fully alive to the gravity of the growing efflux of bullion from India, and in 1830, commenting upon the view expressed by certain district Collectors and the Board of Revenue that the efflux of specie was a major cause of the fall of prices, the Government of Madras wrote :—

'With regard to the observations of the Board—having reference apparently to the late extensive remittances of bullion to England—on the subject of the draining of the precious metals from this country by the combined operations of its

political relations with Great Britain and its external commerce, the Right Hon'ble the Governor in Council is fully sensible that the continued exportation of the precious metals from a country which does not possess sufficient trade or manufactures to recall them must be attended with impoverishing and distressing consequences. But the real question which the Supreme Government and this Government had lately to consider was whether the Company should be exposed to great difficulties at home from the want of those metals which were in the treasury here and relieving them to the full extent of their power, deprecating at the same time the repetition of that demand and endeavouring by all other means to mitigate the evil consequences of such an exportation upon the public credit and the public finance in India.'[1]

The Court of Directors have also admitted that there was a considerable net export of bullion in the thirties.[2]

Several writers have inveighed against this export of bullion on the ground that it was a drain of wealth from the country, but we are not concerned with that aspect of the matter here; nor do we think that even mercantilists will be alarmed when a country which for long periods of time imports precious metals exports a part of it subsequently. What we are concerned with is the effect of these transactions on the currency system of the country. We have to note in this connection that the treasure exported in those days consisted almost entirely of specie.[3] It is true that the imports—small as they were in quantity—were also largely specie, but as they were currencies of foreign countries, they could not get into circulation unless recoined in the local mint. And as for such recoinage we have definite evidence that the 'uncurrent coin' tendered to the mint during the period diminished considerably from year to year, although no seigniorage was charged on recoinage. The following figures taken from the Report of the Mint Master at Madras will make this clear.

[1] *Ceded Districts Handbook*, Ed. by P. Macqueen, I.C.S., Vol. 4590, pp. 247-49. Also extract from Board's Proceedings, dated 9th Sep., 1830, paras 18-21.

[2] Despatch of the Court of Directors to Madras, dated 30th Aug., 1834 (No. 13). (Finance).

[3] The imports and exports of silver on private account were all in specie with very rare exceptions—see Board's Consultations, 25th December, 1859. On the Government account, on the other hand, all the exports had been 'wholly in specie,' as clearly pointed out in the Proceedings of the Board of Revenue, 5th January, 1860, para 3.

STATEMENT SHOWING THE AMOUNT VALUE OF MERCHANTS' BULLION AND UNCURRENT COINS, RECEIVED INTO THE MADRAS MINT FROM 1841-42 TO 1849-50.

Year.	Merchants' Gold and silver outturn value.			Gold and Silver Uncurrent coins outturn value.			Total.		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P
1841-42 ...	7,81,951	0	11	22,53,676	6	9	30,35,630	7	8
1842-43 ...	9,39,328	2	9	8,07,270	9	8	17,46,598	12	5
1843-44 ...	11,93,612	11	11	36,17,818	7	4	48,11,431	3	3
1844-45 ...	4,00,059	15	11	22,06,815	3	6	26,06,875	3	5
1845-46 ...	5,39,034	3	8	25,51,078	11	0	30,90,112	14	8
1846-47 ...	2,11,739	9	5	55,55,400	7	8	57,67,140	1	1
1847-48 ...	1,12,676	11	0	28,90,539	8	9	30,03,216	3	9
1848-49 ...	1,77,895	12	7	12,11,847	7	7	13,89,743	4	2
1849-50 ...	2,44,319	1	7	9,46,903	8	6	11,91,222	10	1

* *Report on the Proposed abolition of the Madras Mint: App. 8 to the Report dated 11th April 1851.*

It is clear from the above table that the bullion tendered for coinage fell off considerably during the period 1841-42 to 1849-50. This was perceptible after the year 1834. The average annual amount of bullion tendered to the mint previous to the year 1834 was Rs. 32½ lakhs. It gradually declined until in 1847-48—the year of the great commercial panic and crisis—it came down so low as Rs. 1 lakh.[1]

The result was that the currency of the country became progressively inadequate to meet the local needs. The suspension of the Madras Mint aggravated this state of things in the thirties and to this fact C. R. Cotton, Special Commissioner, appointed to enquire into the financial stringency of the Presidency, attributes the distress of the time.[2] Indeed the Madras Mint was reopened under orders from the Court of Directors dated 10th May 1839 (Despatch No. 12), but as

[1] Mint Master's Report: 11th April, 1851, para 23.
[2] Cotton's Report (MSS), 1840, para 82.

above pointed out, that did not materially improve the currency situation of the Presidency.

V

Currency Legislation

It may be remarked, by the way, that the influx of gold into England must have been a matter of some convenience at the time to the Bank of England, which was then engaged in building up a gold reserve for the support of its currency system. England adopted the gold standard in 1816, and as this meant the redemption of all notes in gold, every effort was made by the Bank of England to build up a gold reserve. It was therefore natural that the Government of that country should have offered special facilities for the transportation of bullion by the East India Company.[1] This measure had its repercussions on the Indian currency system. Gold became undervalued, and the gold mohur rose from Rs. 16 to Rs. 18. This shook Indian bimetallism to its foundations and made it essential to reorganise Indian currency on a new basis. A reform on the English model was deemed unsuitable. Giving evidence before the House of Commons Committee in 1832, Mr. Horsley Palmer, Governor of the Bank of England, said: 'Gold neither does nor will circulate to any extent as current coin in India whose silver forms the actual currency and is legal tender. . . . . I should be directly opposed to an opinion of the propriety of introducing gold into India as the current coin of the realm'.

Accordingly, India in 1835 gave up its crude bimetallism and adopted the silver standard. There were too many kinds of rupees in circulation, and of this the Arcot Rupee was accepted as the standard coin by Act XVII of 1835. That Act also laid down that gold shall not henceforth be legal tender of payment in British India, and thus demonetized all the gold coins which hitherto passed current in the country. Indeed the bulk of the gold coins had either been hoarded or had gone out of the country, except in the Northern Circars where a considerable number of gold coins seems to have been in circulation.[2] By adopting the Arcot Rupee as the standard coin,

[1] See Despatch dated 10th April 1838.
[2] Dodwell, *Indian Journal of Economics*, 1920-22, p. 201.

Government did away with the currency confusion that then prevailed, and thus laid the foundations of a stable currency system; but the immediate result was not quite favourable. By demonetizing gold and discarding the numerous varieties of rupees, there arose a shortage of legal tender money in the country and this aggravated the fall of prices. Referring to the Act of 1835, Sir J. C. Coyajee says: 'The progress of uniformity of currency though ultimately beneficial brought much immediate and wide hardship on the people, for the withdrawal of debased currency led to a reduction of the circulating medium for a time and led to great fluctuations of prices.'[1]

Not only were the innumerable denominations of currency within British India discarded, but the Indian States and Principalities that came under British suzerainty had also to give up their coinage rights, and this meant the abolition of several mints which hitherto met local needs. Even petty poligars possessed mints of their own.

Paper currency could not make up the deficiency of the circulating medium created by the Act of 1835, for, although the Madras Bank was allowed to issue bank notes, that power was hemmed in by various restrictions in regard to cash reserves and so forth. In 1838, the maximum amount of issue was fixed and the Bank was strictly forbidden from exceeding that limit.[2] Thus the issue of notes was rigidly fixed without any reference to the currency needs of the country. In 1840, Mr. C. R. Cotton reported that a more elastic paper currency controlled by Government was essential, but that question was not taken up till 1860.[3]

Nor are we sure that a more plentiful issue of paper currency would have remedied this state of affairs at the time. Whatever may be the amount of currency coined by the Mint, unless all such currency finds its way into the pockets of the people, it would not really affect prices. In the period under survey, the Company's trade transactions and the Bill policy of the Court of Directors prevented the influx into India of all the monies due to her on trade account; and owing to the parsimonious policy pursued by the Company's Government with regard to public works in Madras, and the abolition of

[1] *The Indian Currency System* (Sir William Meyer Lectures), p. 6.
[2] Despatch of the Court of Directors, 16th May 1838, No. 8 (Finance).
[3] Cotton's Report, 20th Feb., 1840, para. 83.

the Company's textile establishments in various parts of the Presidency, all the currency coined in the country did not get into circulation. The Mint Committee of Madras estimated that although the 'corpus' of the currency was about Rs. 4 crores, more than half of it was locked up in the Government treasuries.[1]

Thus the supply of money in India during the period diminished (1) by the efflux of gold and silver and (2) by the diminution of the circulating medium in India resulting from the Act of 1835.

VI

Demand for Money

At the same time the demand for money increased chiefly by the replacement of barter by money economy and by the growth of business transactions in the country. The demand for money is measured by the extent of the use to which money is put; and when money economy expands and transactions increase, prices are bound to be affected. With the inauguration of British rule in India, the system of cash payments was introduced (a) in land revenue and (b) in other civil and military transactions. In pre-British times, the land revenue in India had been collected sometimes in cash and sometimes in kind. The East India Company insisted on collecting revenue only in cash, and this created some inconvenience to the tax-payers. Nor was time opportune for introducing such an innovation. In the District of Tanjore, a fixed money rent came into vogue during the time of the Amani rents of 1804-07 and was encouraged during the triennial lease of 1807-10. It was finally established in the course of the later Olungoo settlement. Indeed, in the beginning, no compulsion was imposed on the ryots, but Government placed various inducements before them to make the system acceptable. For instance, in 1808-10, with a view to make the Teerwai system acceptable it was decided to revive the ancient village system, for which the Mirasidars had a distinct preference. Vigorous rules were also promulgated for making it difficult for the tenants to continue the system of grain rents, and gradually

[1] Report of the Mint Master, 28th January, 1854, para 50.

the whole district conformed.[1] Similar difficulties arose in other districts also during the period when money assessments were sought to be established.

This transition to money economy cannot be smooth, unless the circulating medium of the country expands according to needs. But with a rigid currency system, with a currency contracting rather than expanding, prices were bound to fall.

Under the Moghuls, both the military and civil establishments were paid chiefly in kind, and the system of giving jaghirs of land was also widely prevalent. The first steps taken by the British Government were to substitute the 'regularly paid and disciplined troops, located in military stations, for the rural militia of the native feudatories and a staff of European and native officials receiving fixed salaries in place of the former mamlatdars and revenue farmers with their followers who paid themselves by perquisites and other indirect gains, but received very trifling emoluments from the treasury of the State'.[2]

To what extent did the growth of cash payments influence the fall of prices? On this, a difference of opinion is possible. A writer in the *Bombay Quarterly Journal* in 1857 opined that the slump was entirely due to 'the extraordinary demand for money occasioned by our collecting the land assessment in cash and conveying it away from the agricultural district to our large military stations for the payment of troops located there.[3] This is an exaggerated view of the situation. No doubt, the use of cash payments did cause a great inconvenience, but a part of what Government collected as land revenue came back to the people's pockets, and to attribute the whole slump to this would be to distort facts.

The demand for money is also affected by the supply of goods exchanged and the number of transactions into which they enter. In other words, if production increases and trade expands the demand for currency will thereby increase, and that by itself will depress prices, other things remaining the same. We have therefore to see how these factors influenced the demand for money.

[1] Tanjore District Gazetteer, chap. xi, p. 172.
[2] *Bombay Quarterly Journal*, April 1857.
[3] The paper is extracted in Aiyangar's *Progress*, p. xxxiv.

In the opinion of Mr. Peddar, these factors had a powerful influence. He says in the course of a note on prices in the *Report on the Moral and Material Progress for* 1882-83 :— 'After the general introduction of British rule, a heavier "duty" was thrown upon the circulating medium by the extension of trade. . . . . With peace and settled government there was a great extension of cultivation and consequent increase of production'. Our enquiries do not confirm this view. That the first experiments in ryotwari revenue settlement were not conducive to the increase of production is now fairly admitted. The first assessments were pitched too high and when the prices fell subsequently, agriculture ceased to be paying, and many ryots gave up their holdings. Mr. Mellor, Collector of Cudappah, wrote in 1845 : 'The universal complaint and request of ryots is to be allowed to reduce their farms, a convincing proof that cultivation is not profitable. Land has never been saleable. Ryots, formerly substantial and capable of laying out their capital on lands and liquidating their sirkar demand, reserving their produce until they could get a favourable price, are now sunk in debt bearing heavy interest, entirely subject to their creditors; and were it not for the aid of the Collector, through the revenue subordinates, one-half or at least one-third of the highly assessed lands would have been thrown up.'[1] So widespread was the discouragement to cultivation that Lord Harris, the Governor, wrote in 1856 that the area under cultivation in Madras was only one-fifth of the whole, and had no tendency to increase.[2] The land revenue demand in 1825-26 was for Rs. 330 lakhs, but in 1829-30, it fell to Rs. 284 lakhs, and by 1833 to Rs. 275 lakhs. The fall was so heavy that it perturbed the minds of the Court of Directors and at their instance an enquiry was made into the 'defalcation' of revenue in Madras. No doubt the fall may be due also to annual remissions of revenue, but this large remission year after year indicates that agriculture was depressed. Indeed in certain years, there must have been bumper crops, and that must have suddenly depressed prices.

While production was thus slackening, population went on increasing. The population of the Presidency was estimated

[1] Letter to the Board, 25th July, In Consultations, 7th December, 1846.
[2] J. M. Ludlow : *British India*, Vol. II, p. 42.

at 13.5 millions in 1822, but rose to 22 millions by 1851, in spite of the famine and mortality due to epidemics in the thirties. This necessitated importation of rice, and at that time imports came from Arakan, which then enjoyed special facilities for the production and exportation of grain. These imports came to an annual value of about 9.5 lakhs between 1834 and 1844, and were largest during the years 1836-42.[1] These imports seem to have influenced prices considerably. The greatest fall of prices occurred immediately after years of large importation. For instance, grain worth nearly Rs. 19 lakhs was imported in 1840-41 and in the following year the index number of prices fell from 74 to 56.

Nor was there during the period any considerable expansion of trade, whether external or internal. The stagnation of internal trade was the dominant characteristic of the time, and this was due to the lack of roads and other means of communication, and to the numerous impediments to free movement of trade, in the form of inland duties.[2] There were very few 'made' roads in the country, and therefore wheeled transport could not have developed. During the summer, communications were easy enough for men, but during winter, it was impeded by swamps and unbridged rivers. Even where there were roads and bridges, communication was impeded by the vexatious exactions of tax-collectors, which were particularly oppressive in Madras, where the inland duties were farmed out by Government.[3] Cotton states in his report that 'the trade of India had been depressed and all classes of the people harassed and discouraged by our mode of taxing the inland traffic'.[4]

As for external trade, it had even a more melancholy tale to narrate. When pepper and calico were in great demand abroad, export trade flourished, but with the loss of external markets in those, trade languished and the weavers lost their employment and some became agricultural labourers or mendicants. In the 18th century, Indian ships plied between the coastal ports and carried on a brisk trade. Masulipatam, Negapatam, Tuticorin and Cochin were then important ports,

[1] Official Memorandum from the Collector of Sea Customs, Madras, 8th July, 1845, Enclosure No. 1.
[2] Transit Duties (Sayer) were abolished by 1844.
[3] Hamilton, *Trade Relations between India and England*, p. 219.
[4] Cotton's Report (MSS.), 1840, para 76.

but with the establishment of British dominion, India came under the Navigation Acts, and therefore indigenous enterprise in trade and shipping had a setback.

At least upto about 1840, foreign trade remained depressed and this caused loud complaints from the Court of Directors in London. Customs revenue was most affected, as is clear from the following figures[1] :—

Year	*Land Customs*	*Sea Customs*
1828–29	Rs. 41,89,703	Rs. 10,55,917
1833–34	Rs. 33,97,200	Rs. 6,80,523

Since 1840, the foreign trade seems to have somewhat recovered, but the slowness of the recovery is clear from the fact that the total export trade only increased by Rs. 50 lakhs between 1834 and 1850. Bengal and Bombay fared much better in this respect.

VII

Conclusion

We will now bring together the different aspects of the problem. A general fall of prices must be due *either* to the diminution of the circulating medium, *or* to the increase of the demand for that circulating medium, i.e., an increase of the transactions to be performed by that medium, or to both. In the present case, we know (1) that the circulating medium diminished in quantity during the period 1820-1850, (2) that the available circulating medium had more duties to discharge, seeing that cash payments had increased and that external trade had expanded to some extent. Both influences were working simultaneously, and that led to the steep and prolonged fall of prices, but the more potent cause was on the supply side. Owing to various causes detailed above, there arose an inadequacy of currency in the country, and this resulted in one of the greatest depressions in the economic history of India.

After 1850, these tendencies changed. The discovery of gold mines in California and Australia resulted in an unprecedented supply of the yellow metal, and pushed up prices in the world's markets to great heights. This gave a great

[1] Despatch, 30th August, 1837, (Finance) paras. 4 and 7.

impetus to productive activity in India as well as in other countries. The construction of railways, the opening of plantations and the establishment of industries financed by British capital in India brought into the country much money from outside, and the growing demand for Indian jute and coffee and tea in Europe made bullion to flow once again in the direction of India. The cotton famine in Lancashire in the sixties gave India an opportunity to expand her exports beyond all proportions and the opening of the Suez Canal further strengthened that opportunity. From 1854, prices went on rising, and not even the Great Depression of Europe in 1873-96 affected India, thanks to the steady fall in the exchange value of the rupee during that period.

KING JAMES I AS MAN OF LETTERS

BY

MR. V. SRINIVASAN, M.A.

I

'Oh', cry'd the goddess, 'for some pedant reign!
Some gentle James, to bless the land again;
To stick the Doctor's chair into the Throne,
Give laws to words, or war with words alone,
Senates and courts with Greek and Latin rule,
And turn the Council to a Grammar School.'

—A. POPE: *Dunciad.* iv. 167–172 (Globe Edn.)

'*The comic offspring of the tragic union of Mary, Queen of Scots with Lord Darnley.*'

It is interesting to speculate as to what would have happened to James VI of Scotland had not a strange fate called him to play the role of king for the British Isles. The present writer has not read Prof. Hearnshaw's *Ifs of History* and is not aware if the matter has come up for the consideration of that eminent historian. None the less, information at our disposal warrants the inference that the Scottish king would have happily died a man of letters.

His literary output was considerable even at the time of his accession to the English throne. And at a later date we find him bewailing sorely[1] that 'being of riper years, my burden of state is so great and continuall without anie intermission', that his affaires and fasherie 'would not permit him to devote himself to literature.' 'Yea scarcelie but at stiller moments have I the leisure to blank upon any paper.'

He was something of a prodigy in his youth when, it is said, he could, at the age of ten, turn a chapter from the Latin Bible into French and from the French to English. He was well read, was exceptionally well-informed in theology and was well-versed in foreign politics. Awfully fond of the chase, he was a mighty hunter and an excellent horseman. A malignant fate placed him

[1] Preface to *Exercises at Vacant Hours.*

on the throne of England. He was least fitted for the job and he proved to be only a nervous drivelling idiot. He had a high opinion of his kingly duties, was, according to Warburton the first to assume the title of Sacred Majesty and believed in the divinity that hedged a king. Such a monarch was quite unacceptable to post-Tudor England. 'If only he had been a canon of Christ Church or a prebendary of Westminster,' the words are Macaulay's[1], 'he would have left a highly respectable name to posterity, and distinguished himself among the translators of the Bible and regarded by a literary world as no contemptible rival of Vossius and Casaubon'.

It was an age of great authors, of Ben and his tribe who had all received their education and apprenticeship in the palmy days of good Queen Bess. Jonson was the preferred poet of James himself and as he wrote, he had

> Eaten with the beauties and the wits
> And braveries of court, and felt their fits
> Of love and hate.[2]

The king knew Shakespeare well and according to an anecdote given by Oldys on the authority of D'Avenant, wrote him a complimentary letter in his own hand.[3] The great dramatist's works were very much in favour at the court and we learn that eight of the fourteen plays put on boards between the 1st November 1604 and the 31st October 1605 were his.[4] The king was no Puritan and was extremely friendly to the stage. A series of entertainments were got up for him during his first visit to Oxford in 1605 and the visit gave a great stimulus to theatrical activity which lasted for some time afterwards.[5] The King Majesty's Declaration, issued to his subjects in 1618, 'concerning lawful sports to be used' gave permission for dancing in the

[1] *Essay on Lord Bacon*, 1837.

[2] *Underwoods*, lx. quoted in Jusserand's *Literary History of the English People*, Vol. II, p. 386.

[3] Shakespeare did not forget the king's compliments. The lines in *Macbeth* (Act IV, Sc. i, ll.119–121) are said to refer to James :

> 'And yet the eighth appears, who bears a glass,
> Which shows me many more ; and some I see
> That twofold balls and treble sceptres carry.'

The passage extracted has obtained a celebrity which reminds one of the 'fair vestal throned by the west' in *A Midsummer Night's Dream* (II. i. 158) said to refer to Elizabeth.

[4] *Essay on English Poetry* prefixed to Thomas Campbell's *Specimens of the British Poets*. See p. lxxii, note.

[5] *Cambridge History of English Literature*, Vol. VI, pp. 316–19.

church and after evensong.[1] He patronised men of letters and assisted in the publication of the plays written under French inspiration by Sir William Alexander, Earl of Stirling. The year 1611 saw the publication of the Authorised Version of the Bible. The period when James lived and reigned, was thus an epoch of plenteous crop in literature and this is an admirable feature of a reign of disrepute.

The king was much interested in the cause of education. He established the St. James College and granted a charter for the founding of an institution at Chelsea to maintain priests that would answer the adversaries of religion.[2] He took upon himself to teach Latin to Car, Earl of Somerset. When, at a later date, the Grand Duke of Tuscany complained of a book—Dallington's *Tuscany*—James ordered the book to be publicly burnt in the cemetery of St. Paul's and the author suffered imprisonment during the Grand Duke's pleasure.[3] We have it also on record that Gondamar, a Spanish ambassador in the court, would speak false Latin to him on purpose, to give him the pleasure of correcting it whereby he wrought himself into his good graces. All of which went to show how much he was interested in learning and scholarship and what a fetish he made of both.

But he himself wrote tolerable verses and some prose which did not lack vigour. He had thus his share in the Renascence movement of the age. In his days Huguenots from France found a refuge in England and the king's hospitality extended to the nationals of other countries as well.

Yet it remains to be told that all that learning could do for him was to make people think of him as a pedant. He was prodigiously conceited, posed himself as being intellectually high above the ordinary level of humanity and held views which he found it difficult to harmonise with the nascent love of freedom that was slowly asserting itself in the country. No wonder he found his path beset with difficulties at every step.

II

The first compositions of James in verse were collected and published in 1584 with the title 'Essays of a Prentice in the

[1] *Cambridge History of English Literature*, Vol. IV, p. 339.
[2] This institution was a failure Laud called it 'Controversy College' and Charles II sold the site to the Royal Society.
[3] Lewis Einstein: *Italian Renascence in England*, p. 121 (*n*).

Divine Art of Poesie'. This volume opens with a dozen sonnets wherein the writer, invoking the blessings of deities like Jove, Apollo, Phœbus, Neptune, Pluto, Mars and Mercury, solicits their encouraging benedictions in his ventures in the realm of poetry :

> ' You all forenamed gods I pray
> For to concur with one accord and will,
> That all my works may perfect be alway :
> Which if ye do then swear I for to fill
> My works immortal with your praises still.' (*Sonnet* 12)

Then follows a poem *Phœnix* treating of the piteous story of the Arabian bird which meets with its end under circumstances extremely tragic—being burnt to death. The death of the grey old fowl grieved the writer and in an envoi he beseeches Apollo to bring her to life : in which case

> ' My tragedie a comike end will have.'

The piece is in good form and runs in rhyming octaves to 37 stanzas.

There is also in this collection a small poem on Time—equally well done. Here is an excerpt :

> ' For what hath man bot tyme into this lyfe,
> Which gives him dayis his God aught to knaw :
> . . . . .
> Bot sin that tyme is sic a precious thing,
> I wald we should bestow it into that
> Which were most pleasour to our heauenly king.
> Flee ydilteth, which is the greatest lat,
> Bot sen that death to all is destinat,
> Let us imploy that time that God hath send us,
> In doing weill, that good men may commend us.'

Towards the close of the collection the author has put down another sonnet wherein he commends his exercises to the reader.

> ' From fountains small great Nilus flood doeth flow :
> Evin so of rawnis do mightie fishes breid.
> Therefore, good Reader, when as thow dois reid
> These myne first fruictis, dispise them not at all,
> Who watts, both these may able be indeed
> Of fyner poemis the begynning small.'

The pieces included in this publication abound in allusions

which testify to his range of study not only in the literature of his own age and country but also in the classics of antiquity.

A table of some obscure words with their significations after the order of the alphabet is appended to the book and there is, at the end, an extract from Pliny on the Phœnix, which has been inserted, explains the author, 'for filling up of the pages'.

Reference may now be made to a sonnet that James wrote in the year of the Armada. He was too shrewd to ignore how intimately the fate of Scotland was involved in the English resistance to the Spaniard, and commemorated the deliverance from that 'foreign and godless fleet' as he termed it:

> 'The Nations banded, 'gainst the Lord of Might,
> Prepar'd a force and set them to the way:
> Mars dress'd himself in sick and aweful plight,
> The like whereof was never seen, they say:
> They forwards came in monstrous array,
> Both sea and land beset us everywhere,
> Brags threatened us a ruinous decay.
> What came of that? The issue did declare:
> The winds began to toss them here and there,
> The seas began, in foaming waves, to swell;
> The number that escap'd it fell them fair,
> The rest were swallow'd up in gulfs of hell.
> But how were all these things miraculously done?
> God looks at them out of his heavenly throne.'[1]

God's name was ever on his lips. The sonnet was considered 'sweet' in his own day and impressed his contemporaries.[2]

One more volume of verses appeared subsequently and was titled 'His Majesty's Exercises at Vacant Hours' (1591-94). These included a translation of the *Furies* of du Bartas, a French contemporary (about whom, more anon) and a poem *Lepanto*, together with a French rendering thereof prepared by du Bartas himself.

[1] 'The same sonnet is extant in Latin by Metellanus, Lord Chancellor of Scotland'. See Earl of Essex's *Ghost. Harleian Miscellany.* Vol. V, p. 235.

[2] In Henry Petowe's *England's Caesar* written in 1603 on the occasion of James's coronation we come across these lines of compliment to the king:

> 'Nor tongue, nor poem, nor witte can truly sing
> His wondrous worth and matchless dignity.
> I meane His glory of the English King,
> Which wraps my muse in all felicite.'

See *Harleian Miscellany.* Vol. X. pp. 342–3

The works mentioned so far were composed while James was reigning in Scotland as James VI. Montgomerie was dead and the Makari epoch was at an end. At a time when an abrupt end was apprehended for Scottish poetry, James's court provided a centre of literary activity and made it possible for Scottish national literature to put forth fresh leaves. Under his distinguished patronage throve several of the better-known figures in later Scottish poetry and his inspiring presence had much to do with the output of writers like Faber, Stewart of Baldines, John Burel and others.

III

We now proceed to consider James's critical code as set forth by him in a short treatise in eight chapters which he attached to the *Essays of a Prentice*. The writer seems to have exerted himself in preparing a body of *Rules and Cautelis* to be observed and eschewed in Scottish poetry: 'I tuke earnist and willing panis to bloke it' says he in the preface.

Invention, says James, is the chief virtue of a poet[1] and comparisons, epithets and proverbs constitute the special ornaments of verse.[2] James then tells us how themes like love are handled in verse and then enjoins the poet not to insert in his works 'a long rable of mennis names, or names of townis or such other names because it is hard to make many long names all placed together to flow well.' He dreads polysyllables and among feet allows only the iamb laying down the rule that the feet, i.e. syllable must be even and not odd. The syllables are divisible into three classes[3] "Ye man understand that all syllables are divided in three kinds . . . . some schort, some lang and some indifferent . . . . By indifferent I mean they which are either lang or schort". James also advocates a cæsura or some kind of sharp division in the middle of a line.

In the last chapter (VIII) we have an interesting description of the various kinds of verses and their respective uses:

(i) Rhyme, which 'serves only for long historie';
(ii) the heroicall stanza of nine lines rhymed *aab aab bab* fit for describing manly feats of arms;
(iii) 'ballat royal' (octavo rima) fit for high and grave subjects;

[1] Chap. vii. Chap. iiii [3] Chap. ii.

(iv) ' the Troilus verse '—the Rhyme Royal, for tragical matters and plaints ;

(v) ' Rouncifals' or jumbling verse (doggerel alliterative) useful for purposes of invective ;

(vi) sonnet verse of fourteen lines and ten feet in every line for ' compendious praising of any books or the authors thereof or any arguments of other histories where sundry sentences and change of purposes are required ;'

(vii) the Common Verse (octosyllabic couplets) to be pressed into service in treating of themes of love ;

(viii) finally, all other sundry kinds of ' broken or cuttit ' verse—' Hall Verse '.

This is the resume of the matters covered by the Schort Treatise. James was a student of Gascoigne and an ardent disciple of Buchanan. Particular note has to be made of his remarks regarding the sonnet and of the restricted use he would put it to. He ignores all uses of that form of verse save for the compendious praising of books or their authors and for the prefatory presentation in brief summary of the topic of any long treatise.[1] Note too must be made of the insistence on the hard and fast sections in verse and his allowance among feet of only the iamb. In these could be traced the influence of French literary models where the iamb had long been the only foot. The dread of polysyllables was however something common to the writers of the age.

Prof. Gregory Smith has remarked that a shame has ever clung to the vernacular prose of Scotland that it is the vehicle for unconsidered scraps and pedantries which could not be conveniently or comfortably done into verse.[2] To this class belongs King James's Short Treatise. Thus in his opinion, the *Rules and Cautelis* is a book of small pretence. But at the same time it is hard to overlook or ignore the value of the publication which indicates to us moderns the canons of poetic taste and style that prevailed in England just before the advent of

[1] The latter usage was very rare in England. Shakespeare experimented with it by casting in the sonnet form the prologues before the opening acts of *Romeo and Juliet*. See Vol. VII, of the works in the Shakespeare Head Edition. (The Variorum puts the 2nd choral sonnet towards the close of the first act itself.)

[2] G. Gregory Smith : *Scottish Literature*, p. 121.

Spenser and Sidney. The unusual shrewdness and acumen exhibited in this treatise certainly make it a document of value. In the words of Prof. Saintsbury it is an honest and by no means unintelligent attempt to make English prosody[1] and hence its publication is to be considered besides Webbe's *Discourse* and Puttenham's *Arte* to be a notable milestone in the progress of Renascence criticism.

IV

'Of late yon God declared his wondrous will
That Uranie should teach this prince most rare:
Syne she inform'd her Scholar with such skill,
None could with him in poesie compaire.'

—WILLIAM FOULER, Sonnet prefixed to the *Essays of a Prentice.*

Of the King's translations we have to refer but to three:—

(i) The CIV Psalm of David made out of the Latin version in the edition of Emmanuel Tremellius (1510-1580) a celebrated Hebrew scholar of Jewish extraction.

(ii) a paraphrastical rendering of some of Lucan's verse.

(iii) *The Uranie* translated from du Bartas (by far the best and the most important of the translations).

Reference has already been made to the stream of French influence on the literary ideals of James I. But French influence was even then only a recent phenomenon. It was not much in evidence in the poetry of Dunbar and became more and more marked only with the accession of Mary Stuart. French poetry was the queen's chief reading, Ronsard and du Bellay grew into raptures over her superb beauty and the verses she made had admirers on the other side of the channel. And her son could not be beaten in his ardour for French poetry.

As for the English people, they had much sympathy for the Huguenot movement and many a refugee had found shelter under their hospitable roofs.

Thus began the process by which French ideals began to exercise a more and more increased influence on English life extending at a later stage to the field of diplomacy as well.

[1] G. Saintsbury: *Criticism and Literary Taste in Europe*, Vol. II, pp. 177–178.

Gillaume de Salluste Seigneur Du Bartas (1544-1590) was the most important figure in the Huguenot intellectual movement who affected the imagination of the English people. The honours that Shakespeare's generation paid him excelled those bestowed on any foreign contemporary of that epoch. Even Ronsard's star waned in his presence.[1]

James was the person who discovered Du Bartas for England. A perusal of the Frenchman's *Uranie* made him an enthusiast and he set himself to the task of introducing him to the English people. The offshoot of this was a translation of the *Uranie*. At that time translations were few and the king's performance furnished a model for imitators.

In his prefatory remarks, James explains why he took to translating the French poem. Nature had not been overbountiful to him, he says and he lacked 'lofty and quik ingyne' to imitate the 'divine and illustrious poet' whom he admired. Hence he began to translate his poem, that having appeared to him as the best form his homage could take under the circumstances. He was not unconscious of his limitations and set the original side by side with the translation. 'I have put in the French on the one side leif and my bloking on the other, noght thereby to give proofe of my just translating but by the contrairy to let appear more plainly to the reader wherein I have err'd, to the effect that with lesse difficulty he may escape those snares wherein I have fallen.'

The sincerity and the modesty animating the preface, as indeed all of James's prefaces, is something which is peculiar and indubitable.

Continuing the thread of his relations with Du Bartas we may refer to his very strenuous efforts directed towards bringing him into vogue in England. Under his direction, a translation was prepared (1584) by Thomas Hudson, of *Judith* an epic of Du Bartas. Before the latter made its appearance, Du Bartas published *La Semaine* which James read with much avidity. *La Semaine* was an encyclopædic poem and by far the best and the most famous of his works. Goethe admired it and it made

[1] Du Bartas was frequently referred to in the literature of the age, books of travel not excepting. The celebrated Welshman, translator and traveller, James Howell refers to him: "Being come to France, their bee some French poets will afford excellent entertainment specially Du Bartas"—Sect. 3, *Instructions for Forraine Travell*. 1612. (p. 25 in Arber' Reprints, Vol. viii).

a profound and deep impression on the British Solomon. He invited its distinguished author to visit England ; which he did. On his return to his native land Du Bartas amply requited James's hospitality by publishing a French version of his *Lepanto* and by eulogising its royal author in the preface. Thus something like mutual laudation passed between the two.

James was not the only admirer of Du Bartas ; a host of English writers fell under the magic spell of the Frenchman's influence. His works were translated by Sidney and Sylvester ; Donne's satires and Drayton's scriptural tracts bore the impress of his unmistakable influence and even the *Paradise Lost* has been acclaimed to be a distant offspring of *La Semaine*. For about a century Du Bartas's fame remained a fixed star in the literary firmament.

The eagerness with which the Elizabethans greeted him is indeed an inexplicable curiosity in the history of literary criticism. Perhaps public opinion towards the close of the sixteenth century was defective in judgment and was inclined as Sidney Lee surmised[1], to set what was second-rate and third-rate above what was first-rate.

Antoine de Montchretien, a Norman poet of humble parentage, was yet another Frenchman whom James patronised heartily. Montchretien was the author of several tragedies modelled on Seneca and had in his best drama, *L'Escossaise* told the last days of Mary Stuart with pathetic accuracy. King James naturally was grateful for the portrayal of his mother and sheltered him when he had to flee from France for his Huguenot credo. Sometime after, James successfully pleaded with Henry IV and procured the refugee's pardon.

V

A third person has to be referred to before we pass on to the other well-known works of James,—namely, *the Demonologie* and the *Counter blaste*. This was John Florio, a Protestant refugee from Italy. Florio was a Florentine and taught at Oxford and at London and eventually was appointed Italian reader to Anne of Denmark, the wife of James[2]. He was a

[1] S. Lee : *French Renaissance in England*. p. 340. Bk. V. Chap. ix.
[2] Lewis Einstein : *Italian Renascence in England*, p. 102. Also S. Lee *ibid.* 170.

familiar figure at the court and was noted for his translation of Montaigne's essays. He did much to popularise Italian amongst the gallants of the city and his pupils included the Earl of Southampton, the patron of Shakespeare.

Next to France Italy exerted on Elizabethan civilisation an influence which might be traced back to the days when Chaucer sojourned in the peninsula. Even Shakespeare alludes to the fashions introduced into England of his day :

> fashions in proud Italy,
> Whose manners still our tardy apish nation
> Limps after in base imitation.[1]

Italian crimes furnished the subject-matter of the tragedies written during the reigns of Elizabeth and James and again it is well-known that—thanks to Wyatt and Surrey—, the sonnet too came from Italy.

VI

Plays with witches formed an important branch of the drama of the age, and the *Witch of Edmonton* by Rowley, Dekkar and others is a well-known production in this class of literature : the witch represented in the play being supposed to refer to one actually executed.

When Reginald Scott, an Englishman had the temerity to deny the existence of witchcraft, James rebutted his arguments. This he did in the dialogue—*Demonologie*—which was published in 1597.

The King believed in demons and spirits but held with Roger Bacon that the infernal world was not beyond God's dominion.

His essay partakes of the nature of a manual,and recapitulates with ample quotations the various theories held by previous demonologists. Digressions there are, on philology and ecclesiasticism, but these do not detract from the value of the book which is marked by a fulness of detail that does credit to the writer. It is a scholarly performance on the whole and is referred to in Boswell's *Life of Johnson*.

Some of the recommendations contained in James's paper inspired Parliament to enact a law condemning witches to death. *Basilikon Doron* or " Instructions to his dearest

[1] *Richard II*, Act II, Sc. i, ll. 21–23.

sonne ", Charles, (written about 1599 and published secretly, the edition being limited to seven copies) is another important work of James wherein are enshrined his real thoughts. It is in this work that James first indicated his predilections towards the system of Government by Bishops over which so much trouble was to brood during the reign of his successors. The work inspired Sir Walter Raleigh to prepare " for his son and to posterity " another book on the same lines.

A French version of *Basilikon Doron* was published at Paris in 1603 by Vielliers Hotmann, one of the earliest instances of a book being translated from English into French.

VII

The *Counterblaste to Tobacco* was perhaps the first production of James to be published after his accession to the English throne. Raleigh is credited with the introduction of " tobacco drinking " into the kingdom. It had developed into a vicious national habit[1] and tobacco pamphlets became a part of the social literature of the land. King James who like his contemporaries, Shah Abbas of Persia and Jehangir of our own history, considered it a noxious drug, wrote his famous attack.

In a brilliant preface he has told us how much perturbed he has been by the alarmist growth of the tobacco drinking habit which held, octopus-like, the whole English nation in its tentacles. He upbraids the people for their sluggishness. ' Our peace hath bred wealth, and peace and wealth hath brought forth a general sluggishness which makes us wallow in all sorts of idle delights, soft delicacies, the first seeds of the subversion of all great monarchies. Our clergy are become negligent and lazy, our nobilitie and gentes prodigal and solde to their private delights, our lawyers covetous, our common people prodigal and curious, and generally all sorts of people more careful for their private ends than for their mother, the Commonwealth.' This was unworthy of the English people. ' It is the king's part to purge society of all these diseases by medicines meet for the same, to maintain peace, to make them ashamed of sluggish

[1] Ben Jonson's *Every Man In his Humour* (1596) has a reference to the habit See Act. III. Sc. ii. Also Spenser : *Faerie Queene*. III. v. 32.

' There, whether yt diuine tobacco were,
Or Panachaea or Polygony she found."

delicacies, to waken the clergy to be more diligent in their offices and all these generally by the example of his own person by removal of abuses and by the due execution of good laws.' "And surely in my opinion there cannot be a more base and yet hurtful corruption in a country than in the ill use (or abuse) of taking tobacco in the kingdom which hath moved me sharply to discover the abuses thereof in the following little pamphlet. '

Having elaborated in this manner the *raison d'etre* of his brochure James severely rebukes the Englishman for his addiction, to his own destruction, to a habit which was but an antidote amongst primitive society to a filthy malady. After some quaint and vigorous descriptions of the disgusting habits of the smoker we have a detailed refutation of the arguments advanced in favour of the use of the herb. Suffimigation does no good either to the mind or to the body and the encomiums bestowed on the herb[1] says James, are all meaningless. The drinking habit has nothing to recommend it. It is but a branch of the sin of drunkenness which in turn is the root of all sins. You are only disabled and rendered effeminate on account of a custom,

'so lothsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs and in the black stinking fume thereof nearest resembling the horrible Stygian smoke of the pit that is bottomless."

So ran James's thesis.

Not content with this tirade he issued in October 1604 a proclamation—Commissio pro tobacco—augmenting the customs duties on the article, and directed the High Treasurer of the Realm to actively co-operate with him in the campaign against the obnoxious habit.

[1] *Cp.* this extract from a poem written by an enthusiast in an Ovidian style :

' The faire mother of all fragrant flowers :
From which first love aglorious Sample springs,
Beloved of heavenly gods and earthly kings.
.....
The sweete and sole delight of mortall men,
The cornucopia of all earthly pleasure,
Where bankrupt Nature hath consumed her treasure,
A worthie plant springing from Floraes land
The blessed offspring of an uncouth land.'

It was in this strain that the pamphleteers of the time wrote of the Promethean virtues attributed to tobacco.'

Many a writer took the cue from the sovereign[1] and ere long tobacconists fell into ridicule. It is wonderful to reflect on the extent to which the theme proved to be a favourite whetstone for the wits of the age.

VIII

James published in his reign several other works most of which however were tracts deserving little more than mention. Such are: (1) Triplici Nodo Triplex Cunens. 1605. (2) A Premonition to all the Mightie Monarchs, Kings, Free Princes and States of Christendom. 1609. (3) A Remonstrance for the Right of Kings. 1615. (4) A Meditation of Revolutions.

Interesting particulars could be found in the Second volume[2] of Rowland Gardiner's *History of England* during the period 1603-1642, of the circumstances under which James, by interfering in a controversy between the Spanish Court, Henry IV of France and the Pope, contrived to transfer the dispute from the sphere of diplomacy to his favourite field of literature. Thus was written *the Apology for the Oath of Allegiance* (1609) wherein he attacked the two breves and indicated the right of temporal authority against the ecclesiastical power.

IX

More remarkable than these is *"The True Law of Free Monarchies"* which has an abiding interest to all students of history. It forms a part of the literature on the Divine Right of Kings about which a battle royal has been waged. James had ever had an exalted sense of duty: witness, for instance, his solicitude for the welfare of his subjects which finds expression in the preface to the *Counterblaste*.

The king, according to James, was the fountain of honour, justice, and the mainspring of all power, civil and military, and as such ought to be looked to as the hope of public-spirited conduct in the realm. He was the supreme Trustee of the nation—that was the claim forwarded by James in the *True Law* under reference. He believed—and sincerely—that the divine right of succession lodged in the ruler was not capable of alteration by

[1] As for instance Richard Braithwaite the author of '*The Smoking Age*' 1617.

[2] Pp. 27-28.

any human authority: much the same thing that Shakespeare put in the mouth of his *Richard II*:

> 'Not all the water of the rough rude sea
> Can wash the balm off from an anointed king.
> The breath of worldly men cannot depose
> The deputy elected by the Lord.'[1]

Any attempt to act up to such a political philosophy was doomed to fail in Renascence England and it is not surprising that many of James's and his son's undertakings in which they endeavoured to execute what they held to be their trusteeship, miscarried and miscarried disastrously.

X

But there is no mistaking the sincerity with which James bolstered up the arguments in support of his views. In a different age the position he took up would have been acknowledged as substantially correct. It was his misfortune that times were too far out of joint for him.

James was an indifferent writer but a clear one. He is forcible and knows how to drive home his points. His speeches were scarcely less vigorous: that is evident from all contemporary accounts.

A certain promptness of wit, much solid judgment and acute critical ingenuity are certainly his and the claim as man of letters can no more be denied him than the question whether Pope was a poet be decided against the sage of Twickenham.

Viewing the Bodleian once, he is said to have exclaimed: 'Were I not a king I would be an University man, and if it were so that I must be a prisoner, if I might have my wish I would have no other prison than this library and be chained together with these good authors.'[2] A mere nincompoop could not have expressed himself thus. Literary conscience compels one to conclude that James was a zealous votary of literature and that posterity has scarcely been charitable to him. It is unfortunate that a dispassionate judgment of the man could not be divorced from unfavourable notices of the ignominious foreign policy of the reign. And it has to be conceded that he was a captain of arts though but a clerk of arms.

[1] Shakespeare: *Richard II*. Act. III. Sc. ii. ll. 54–57.
[2] Isaac D'Israeli: *Curiosities of Literature* Vol. I, p. 466.

THE OOGENESIS OF *EMERITA ASIATICA*[1] MILNE-EDWARDS

BY

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The present paper contains an account of the reproductive organs and the history of the cytoplasmic inclusions, particularly their share in vitellogenesis, the chromosomal history being reserved for a subsequent contribution. The work was carried out in The University Zoological Laboratory, under the guidance of Professor R. Gopala Iyer, the Director, and I wish to thank him for his unfailing help and advice. I am indebted to the Madras University for awarding me a research studentship and thus enabling me to pursue this work.

The history of the cytoplasmic inclusions in oogenesis has claimed the attention of a number of cytologists in the past few years, as a result of which the oogenesis of a number of animals belonging to almost all the major classes of the animal kingdom has been investigated.[2] Among the crustaceans, with which alone we are concerned in the present paper, *Oniscus asellus, Carcinus mœnas, Lygia oceanica, Calanus finmarchicus, Scylla serrata, Palæmon lamarrei,* and *Paratelphusa spinigera* are the forms that have been studied. Since the later papers contain good summaries of previous work I shall merely give below a tabulated statement of the most important of their conclusions, namely,

[1] The name *Hippa* was changed into *Emerita* in 1900 by J. E. Benedict and the latter has been accepted by all American Carcinologists.

[2] For a summary of work done till 1931 see the article on Zoology by Prof. MacBride and Hewer in *Recent Advances in Microscopy*—Biological. Edited by A. Piney, 1931.

those relating to the role of the various inclusions in yolk formation.

Name of form	Albuminous yolk.	Fatty yolk
Oniscus ...	Mitochondria swell and become converted into albuminous yolk.	Golgi elements swell and become fatty yolk.
Carcinus ...	By the deposition of material in the Chromophobe part of Golgi elements to which is added extruded nucleolar matter.	Arises *de novo* in the cytoplasm.
Lygia	Arises from the Golgi apparatus	Do.
Calanus ...	Formed in the mitochondria by the transformation of part of their own substance and the deposition in them of substances derived from the nucleolus and the cytoplasm.	*nil.*
Scylla ...	Nucleolar extrusions may indirectly influence the synthesis of proteid yolk.	Golgi elements swell and form fatty yolk
Palæmon ...	Mitochondria swell and become albuminous yolk.	Do.
Paratelphusa.	Nucleolar extrusions grow directly into yolk.	Do.

The table brings out quite clearly the important fact that even in the same class of animals the origin of yolk has been noticed to be different in different species. This is particularly so in the case of albuminous yolk, in the formation of which all the cytoplasmic inclusions, namely, Golgi elements, mitochondria, and nucleolar extrusions take part either individually or collectively.

Material and method.—The work was mainly carried out during the months of March, April, May and June, when ovaries contain eggs in different stages of growth. For purposes of fixation freshly secured animals were opened in the living condition and small pieces of ovary were cut off

and transferred directly to the different fixatives. Bouin's fluid was used as a general fixative. For the study of the nucleolus the above fixative followed by iron hæmatoxylin gave very satisfactory results. Material fixed in corrosive acetic and stained in Mann's methyl-blue eosin was also very useful. For the detection of chromatin Feulgen's 'Nucleal-reaction' was adopted. Staining in pyronin-methyl-green furnished information for chromophility. Methods for mitochondria included Flemming without acetic and iron hæmatoxylin, Chamy-Kull and Kolatchev-Nassonov. The last mentioned method gave the most satisfactory results for the demonstration of Golgi elements also. Ludford's modification of the Mann-Kopsch method was tried, but was not very useful. It may be of interest to note here that for both of the above methods the necessity of an incubator was not felt since the atmospheric temperature of the place in the hot months in which the work was done comes very nearly up to what has been recommended. Osmication for five days in the Kolatchev-Nassonov method produced excellent impregnation of the Golgi apparatus, which were jet black in sections. The method of Da Fano was very unsatisfactory though the material was left in the fixative and silver nitrate solution for varying periods. It should therefore be mentioned here that all the observations on the Golgi elements recorded in the subsequent pages are based mainly on the results of the above mentioned chrome-osmiun method.

In addition to the above methods absolutely fresh tissue was frequently studied in a drop of sea water. Pieces of ovary stained post-vitam in janus green (strength about 1 in 30,000) and osmicated in 2 per cent osmic acid were also studied; fresh and formalin fixed material stained in Sudan III was made use of to detect the presence of fat. In view of the unreliability of the action of neutral red solution as demonstrated by Gattenby and others on various kinds of cells, (8) no attempt was made to study material stained by this dye intra vitam.

Observations

Ovary: Fig. 1. The ovaries lie partly in the thorax and partly in the abdomen. The anterior end of each ripe ovary

is a flattened structure, consisting of two main lobes, one extending forwards and the other to the sides.

Each lobe is again divided into smaller lobes. The posterior part of the flattened portion of each side is connected by a transverse bridge of ovarian tissue lying above the pyloric part of the stomach. Behind the transverse connection each ovary is cordlike, lying in close contact with each other, over the midgut. In the sixth thoracic segment the two fuse to form a common median portion which extends to the fifth abdominal segment usually along the left side of the alimentary canal.

The oviducts are short straight tubes arising on each side from the hind end of the middle portion of the ovary. They run down and open on the inner side of the coxopodite of the sixth thoracic leg.

Syncitium and Early oocytes. Figs. 2 and 3. The germinal tissue is in the form of a syncitium. The nuclei are small, oval bodies containing a faintly staining recticulum and a few nucleoli. Groups of these nuclei which are destined to give rise to the oocytes then enlarge and undergo the early prophase changes of the reducing division. At first the chromosomes appear as a network of threads which stain well in hæmatoxylin. Although in all fixed preparations the early stages of the oocytes are so crowded together as to make the detection of cell boundaries impossible, it seems probable that at this stage they become cut off from the syncitium. These early oocytes have very little cytoplasm around the nuclei. Some of the nuclei are represented in Bouin iron hæmatoxylin preparations in the form of dark grey masses in which a number of black-granules are imbedded (Fig. 3 deg. n). They are probably degenerating nuclei. The spireme is followed by a synizesis stage from which emerge the bivalents. The bivalents show a tendency to move towards the neculear membrane. In the further stages of growth of the oocytes the bivalents gradually become extensively branched and stain more and more feebly. At the commencement of this change each of these oocyte nuclei has assumed the appearance of a typical germinal vesicle more or less round and several times bigger than the syncitial nuclei. The chromosomes seem to remain in this diffused condition throughout the subsequent stages of

growth. Many of these older oocytes are surrounded by several nuclei (Fig. 2) which may be concerned in the nutrition of the oocytes.

Chromatin.—After Feulgen's test the syncitial nuclei are bright purple in colour with very little unstained space in them. In the nuclei of the early oocytes the spireme and the bivalents are well stained but the other parts of the nuclei are uncoloured, thus showing that all the chromatin is concentrated in these threads. In the later process of diffusion undergone by the bivalents a progressive dimunition in the intensity of staining takes place, till in about a half grown oocyte hardly any staining is noticeable.

Nucleolus.—The nuclei of the syncitium contain a few basophil granules. A small oxyphil nucleolus appears at about the time of the formation of the bivalents (Fig. 3). It stains bright red in Mann's methyl-blue eosin and pyronin-methyl-green. It is uncoloured after Feulgen's test and hence appears to be a plasmosome. Usually it occupies an excentric position inside the nucleus. It grows along with the oocyte but does not change in position markedly. Even in the young oocytes a few small irregular bodies staining identically with the nucleolus occur inside the nucleus (Figs. 6,7) some of which are occasionally found near the nuclear membrane. These are the early nucleolar extrusions which may ultimately find their way into the cytoplasm.

As the oocyte grows the activity of the nucleolus seems to increase, attaining a maximum in those which are about a third of the mature oocyte in size and in which albuminous yolk has not yet appeared. In the nucleus of such an oocyte small irregular masses of nucleolar matter are scattered about, some occasionally remaining in contact with one another (Fig. 4). Many are seen closely pressed against the nuclear membrane. Though no particles resembling nucleolar extrusions could be seen in the cytoplasm, minute black granules are seen sticking to the outside of the nuclear membrane in sections stained with hæmatoxylin (Fig. 5). The condition in which they come out, whether as entire bodies or as a fluid is not clear. It may be, as Hilton has remarked, that the granules on the outside of the nuclear membrane are due to the condensation of fluid matter during fixation.

The appearance of the nucleolus undergoes considerable alterations during this period of activity. At first it was homogeneous, staining red in methyl-blue eosin and pyronin-methyl-green and black in hæmatoxylin. But as the process of extrusion of matter progresses the colour becomes fainter and fainter. At the same time a large central vacuole surrounded by several smaller ones appears in it. The appearance varies slightly in material prepared according to the Champy-Kull, Kolatchev-Nassonov and Ludford techniques. In some a central vacuole can be seen which is practically colourless (Fig. 11). The rest of the nucleolus is of a pale yellowish green colour in which a number of dark green minute vesicles are present. In others only these smaller vesicles are noticed (Fig. 12).

During the later growth of the oocyte the nucleolus remains comparatively inactive, since the nuclei of these oocytes contain very few extrusions. The ultimate fate of the nucleolus has not been traced.

Golgi apparatus.—No trace of a Golgi apparatus could be discovered in the syncitium. In the earliest oocyte also a clearly defined apparatus was not visible in any of the preparations. Nor was the method of osmication of fresh tissue in 2 per cent osmic acid successful. In a slightly grown oocyte represented in Fig. 6 on one side of the nucleus there are two or three bodies which are darker than the surrounding greenish yellow mitochondrial material in Kolatchev-Nassonov preparations. These bodies might represent the feebly impregnated Golgi elements. In a still older oocyte, however, unmistakable Golgi elements in the form of more or less round vesicles with intensely black rims and pale interiors are present (Fig. 7). As the oocyte grows these increase in number and spread out in the cytoplasm. As the elements spread they grow in size to some extent. In some preparations there were a few irregular elements (Fig. 8). These are believed to be imperfectly impregnated and collapsed ones. Ultimately they become uniformly distributed in the cytoplasm. In the later stages they show some amount of resistance to fixatives containing acetic acid, as some of them have been noticed in material fixed in corrosive acetic and as indicated by the appearance described below,

noticed in material fixed in strong Flemming (with acetic).

Even while the Golgi elements are gradually spreading, some of them grow, though not very much, and a gradual accumulation of fat takes place inside them (Fig. 8). These vesicles do not at any stage attain to the enormous size that has been noticed in other animals. These fatty vesicles have their interior also blackened to the same extent as the rim. In preparations of material fixed in strong Flemming (with acetic) and mounted after dissolving away the paraffin an appearance represented in Fig. 18 can be noticed. The smallest Golgi vesicles are in the form of black granules. Some of the larger ones which have withstood the action of canada balsam are uniformly black while the majority are decolorised and look like empty vesicles with dark grey rims. Irregular and crescentic forms are also present, but the latter seem to be optical sections of vacuoles. If the same sections are examined after immersion in turpentine for an hour and a half all except the smallest appear as empty vacuoles with grey rims. In stained slides only empty spaces are left, probably due to the dissolving action of alcohol.

Older oocytes prepared according to the Flemming without acetic method and mounted unstained contain several Golgi elements in the form of irregular black bodies wedged in between the albuminous yolk globules (Fig. 19). Some appear in the form of vacuoles with dark grey rims while others are crescentic. Such appearances are very rare in the Kolatchev-Nassonov pereparations. Since the crescentic structures are not met with in younger oocytes devoid of albuminous yolk globules and in Kolatchev-Nassonov preparations they seem only sections of the vesicular Golgi bodies. Granules uniformly black or light grey are also present, the latter of which being osmicated fatty yolk globules decolorised by canada balsam.

Examination of fresh tissue mounted in a drop of sea water proved highly useful for studying the formation of fatty yolk. In a very young oocyte the Golgi elements were not visible. In another of the size represented in Fig. 14, however they can be clearly seen in the form of highly refractile tiny vesicles of varying sizes and gray granules

mostly confiend to one side of the nucleus. This corresponds more or less to the stage shown in Fig. 8 in which the Golgi elements have not spread to all parts of the cytoplasm. The bigger vesicles are of a pale greenish yellow colour, while the smaller ones appear grey. In a third and bigger oocyte (Fig. 15) they have spread still more and at the same time the number of greenish yellow vesicles has increased very much. As shown in Fig. 15 these lie mostly on the outer half of the cytoplasm. In still more advanced cells (Fig. 16) they are present in all parts of the cytoplasm. When a drop of Sudan III solution was run under the coverglass all the larger vesicles turned a deep reddish orange in less than a minute while the smaller ones showed varying shades of yellow. The granules could not be seen. It is therefore clear that the vesicles are really Glogi bodies in which fat is being gradually deposited, raising their refractive index and visibility.

In the ripe oocytes most of the Golgi elements have become globules of fatty yolk. In osmic acid tests these did not go black in a few minutes but became completely black only after osmication was continued for several hours. The smaller ones were browned to varying degrees. The smallest had black rims and pale inside.

Mitochondria.—All of the fixed preparations were unsuitable for the study of the early oocytes due to extreme crowding. The syncitium does not show any substance resembling mitochondria. In some preparations stained with iron hæmatoxylin a grey structureless mass was occasionally noticed lying at one end of the nucleus of the very young oocytes (Fig. 13). A corresponding body stained pink in Champy-Kull material. This mass soon expands and forms a ring around the nucleus (Fig. 6). At this stage it is clearly visible after any of the methods for mitochondria mentioned above. In Flemming without acetic followed by iron hæmatoxylin it is deep grey, pink by Champy-Kull and greenish yellow in Kolatchev-Nassonov (unstained).

Gradually the circumnuclear ring expands outwards without breaking away from the nuclear membrane (Figs. 7 and 8). In this expanding mass definite granular mitochondria can be made out. Finally in an oocyte which is little more than

a fourth of a mature one in size the mitochondria are evenly distributed in the cytoplasm. They are extremely numerous minute spherical granules staining dark grey in iron hæmatoxylin.

As growth progresses they become bigger and show more affinity for stains. Soon albuminous yolk begins to appear. Usually the first-formed yolk masses are near the periphery, though occasionally they seem to arise in any part of the cytoplasm (Fig. 9). Each of these globules under high magnification is seen to consist of a clump of enlarged mitochondria (Fig. 10). In some sections prepared by the Kolatchev-Nassonov method various stages in this process can be seen. Each of them lies in a clear area of the cytoplasm.

In later stages of growth yolk formation becomes more rapid and takes place in all parts of the cytoplasm (Fig. 11). Many of these later yolk droplets are smaller than the earlier ones. Some are formed by a few mitochondria, while others arise by the direct transformation of individual mitochondrial granules. During the process of formation most of the yolk spheres, except the smallest, show numerous vacuoles or in stained preparations granules inside them (Fig. 11). Structures showing such internal differentiation have been noticed by Bhatia and Nath among the swollen mitochondria of the oocytes of *Palæmon lamarrei*. Most of these vaculoles disappear in the fully formed yolk granules, many of which have now become irregular in shape (Fig. 12). A fully grown oocyte is packed with these yolk masses, between which are found the fat globules and unmodified Golgi bodies (Fig. 17); the cytoplasm having shrunk to a narrow layer around the nucleus which is usually found at one pole.

In Kolatchev-Nassonov preparations the initial stages of the albuminous yolk globules are of a pale greenish yellow colour. But the older ones are dark and sometimes even black. In Ludford material all except the smallest ones are black. The blackness can be removed by keeping the slides for three to four hours in turpentine. It would seem therefore that the time of osmication, namely five days in the former and three in the latter is slightly longer than is necessary for this material.

Cytoplasm.—In the youngest oocytes the cytoplasm is

strongly oxyphil and is stained bright red in pyronin-methyl-green and methyl-blue eosin. With the growth of the oocyte the cytoplasm gradually becomes basophil. The yolk masses are faintly green in pyronin methyl-green, but stain purple in methyl-blue eosin. In the growing globules stained by the latter method a number of dark granules are present. They are however absent in the smallest as well as the fully formed yolk droplets. The cytoplasm gets much vacuolated in later stages (Fig. 11) the process beginning long before the onset of albuminous yolk formation. In some of the early oocytes a comparatively large vacuole was noticed on one side of the nucleus, which seems to disappear in older oocytes.

Discussion.—The account given above contains few points of outstanding importance requiring detailed consideration here. So far as the nucleus is concerned the absence of chromatin in the older oocytes as revealed by Feulgen's test is the most interesting point to be noted. This phenomenon has been noticed by Koch (20) in the oogenesis of Chilopods, and his conclusion was that the chromatin undergoes some chemical change during the growth of the oocytes. Ludford (21) could find scarcely any chromatin in the oocyte nuceli of *Limnæa stagnalis*. Some however were noticed to have a faint purple coloration. While recognising the probability of chemical change, he is inclined to believe that the chromatin may be so finely distributed as to render its demonstration impossible by this method. Gresson also records a similar disappearance of chromatin from the oocytes of saw flies and adopts Koch's (20) explanation for the phenomenon. The same may hold good in the case of *Emerita* also, since the changes outlined above are essentially similar to what the latter author has noticed.

The process of yolk formation is initiated comparatively very early in the present form. The origin of fatty yolk from Golgi elements has been previously observed in several invertebrate animals, viz. in *Oniscus, Scyila, Palæmon* and *Paratelphusa* among Crustacea; *Luciola, Periplaneta, Dysdercus, Culex* and saw flies among Insecta; in the scorpions; in the scolopendrid *Otostigmus;* in the spiders; in the mollusks *Helix, Patella* and *Pila*. The process of fatty yolk formation

in *Emerita,* as described above, is similar to what takes place in these animals, namely, the gradual enlargement of the Golgi bodies and the accumulation of fat inside them, though in the present case the increase in size is not considerable.

Whether the process of transformation is simply a case of condensation of neutral fats inside them due to their own activity or whether it is really a chemical change in which some portion or the whole of them gets converted into fats is not quite clear. Bell (1) has described a direct transformation of groups of Golgi granules into neutral fat in the spermatids of the dog and adduces chemical evidence in support of his view that the Golgi elements consist of phospholipins. In a recent paper, after reviewing the evidence furnished by the osmic acid, Scharlach R and Sudan III tests on the Golgi elements and fatty yolk of a number of animals, Nath (24) comes to the conclusion that the osmiophilic part of these bodies 'consist of unsaturated lipoids and the osmiophobic part of very nearly fully saturated lipoids'. At some stage in oogenesis in several animals these lipoidal elements, which at first do not stain in the two latter dyes, are converted into fats when they are stained brilliantly. It may be quite probable that a portion of the Golgi elements undergoes chemical change in the formation of fatty yolk. But the presence of rims around fully formed fatty yolk as noted above, seems to indicate that secretion of fat may be taking place at the same time.

The transformation of mitochondria into albuminous yolk has been noticed in some other animals also besides the Crustaceans mentioned previously. Brambell (7) has recorded it in *Helix* and *Patella,* Gardiner (9) in *Limulus* and Hirchler (18) in *Ciona.* The mitochondria in all these cases swell and become albuminous yolk.

In several cases nucleolar extrusions have been noticed, and are believed to take part in the formation of yolk.

The following facts of observation lend support to this view.

i. The phenomenon of nucleolar extrusions has been observed by almost all workers on oogenesis. (For a summary of work on nucleolus see Gresson 11.)

ii. The period of maximum activity of the nucleolus is

either just before the commencement of vitellogenesis as in *Emerita*, or coincident with the latter as in *Calanus*.

iii. Gardiner has proved that in the oocytes of Limulus the nucleolar extrusions convey some substance rich in phosphorus from the nucleolus to the cytoplasm, which is used in the synthesis of yolk.

iv. In several animals these nucleolar extrusions have been noticed to give rise to albuminous yolk directly. (*Saccocirrus, Luciola, Dysdercus, Periplaneta,* Saw flies and *Paratelphusa.*)

The observations of Hilton (17) and Harvey (15) in *Calanus* and *Carcinus* respectively seem to furnish direct evidence for a combination of nucleolar matter with yolk. The former noticed a darkly staining cloud around groups of mitochondria at some stage in oogenesis and attributes it to an accumulation of nucleolar material. Harvey noticed the presence of a central chromophil core in some of the large peripheral yolk globules similar to the plasmosomal granules scattered in the cytoplasm. The core gradually expanded and finally the yolk globule stained brilliantly.

In view of the above facts and the activity of the nucleolus sketched in the section dealing with it, it is possible that albuminous yolk is formed in *Emerita* by the deposition of substances derived from the nucleolus and perhaps from the cytoplasm inside the swollen mitochondria, which themselves might undergo some chemical change in the process.

Summary

1. The germinal tissue is in the form of a syncitium. Groups of these nuclei enlarge and undergo the early prophase of reducing division, during the course of which they become cut off as definite oocytes.

2. During the growth of the oocytes the chromatin of the nuclei gradually diminish and finally disappear as revealed by Feulgen's test.

3. The nucleolus is a plasmosome. Nucleolar extrusions begin very early, but become most marked a little before the commencement of albuminous yolk formation. It is suggested that they contribute some substance in the synthesis of yolk.

4. In the syncitium no Golgi elements appear to be present. The youngest oocytes also did not reveal their presence by any of the usual methods. In slightly older oocytes a few vesicular elements make their appearance. These gradually increase in number, spread in the cytoplasm and eventually most of them become fatty yolk.

5. Mitochondria are absent in the syncitium. In the young oocytes they form a structureless mass on one side of the nucleus. Gradually the mass grows and becomes a circumnuclear ring, which then spreads outwards, ultimately becoming evenly distributed in the cytoplasm in the form of innumerable minute granules.

6. The granular mitochondria swell, clump together and give rise to albuminous yolk. After some time the process becomes more rapid and takes place in all parts of the cytoplasm. At this stage the mitochondria may collect into small groups and give rise to yolk droplets or may directly become separate yolk globules.

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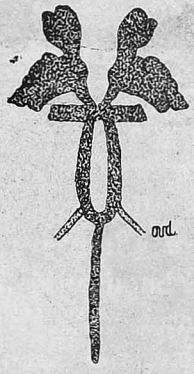
ABBREVIATIONS.

al.y.	...	albuminous yolk.
b.f.g.	...	blackened fat globules.
biv.	...	bivalents.
bq.	...	bouquet stage.



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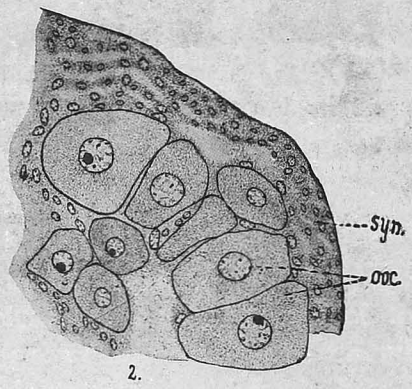

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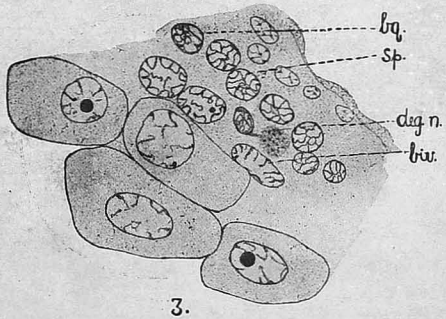

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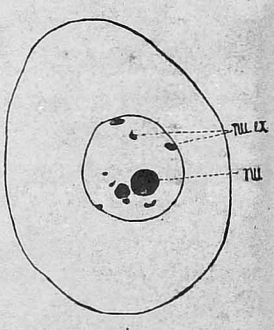

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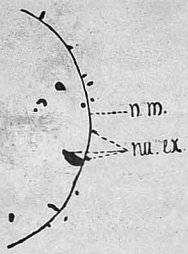

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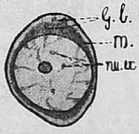

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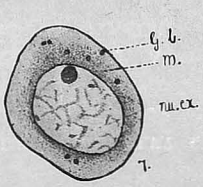

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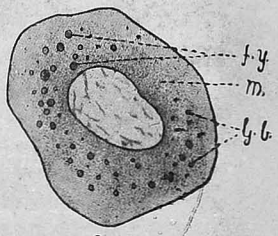

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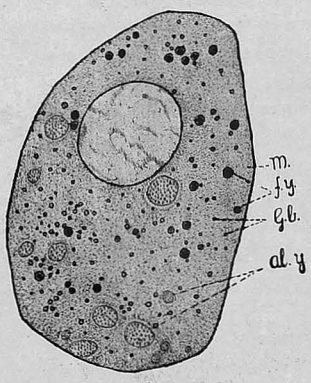

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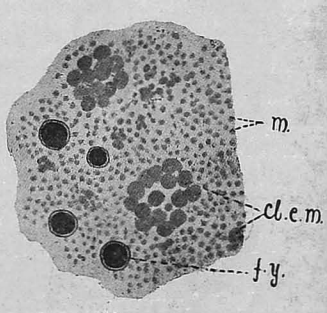

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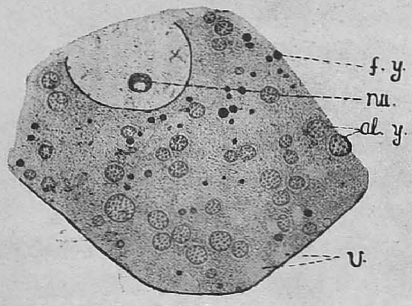

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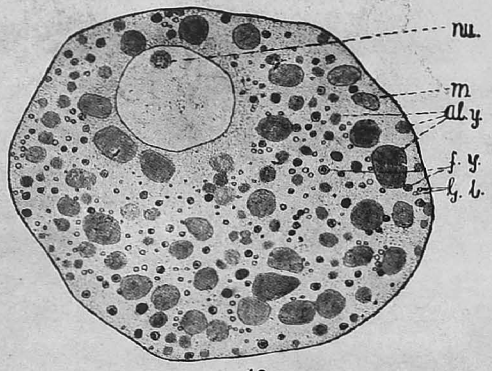

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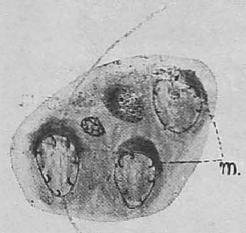

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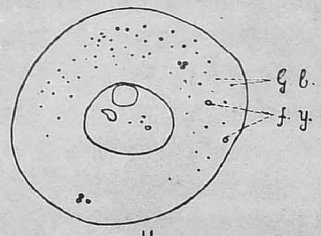

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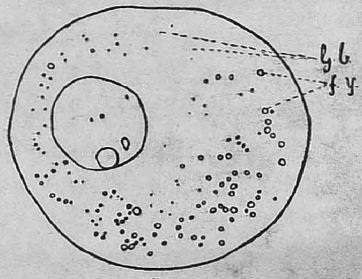

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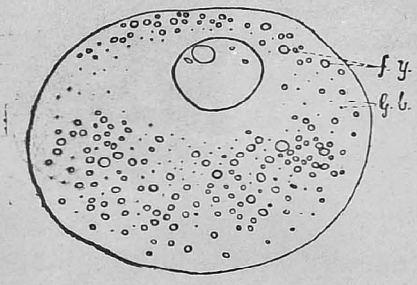

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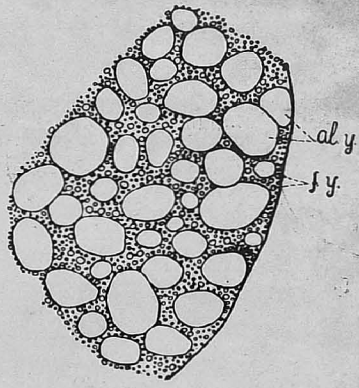

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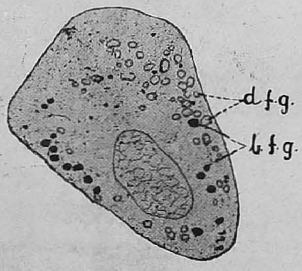
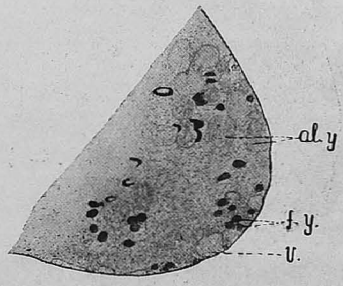


18.



19.

cl.e.m.	...	clumps of enlarged mitochondria.
d.f.g.	...	decolorised fat globules.
deg.n.	...	degenerating nucleus.
f.g.	...	fatty yolk.
G.b.	...	Golgi bodies.
m.	...	mitochondria.
n.	...	nucleus.
nu.	...	nucleolus.
n.m	...	nuclear membrane.
nu.ex.	...	nucleolar extrusions.
ovd.	...	oviduct.
sp.	...	spireme.
v.	...	vacuole.
K.N.	...	Kolatchev-Nassonov.
Ch.K.	...	Champy-Kull.
F.W.A.I.H.	...	Flemming without acetic followed by iron hæmatoxylin.
B.I.H.	...	Bouin's fluid and iron hæmatoxylin.
Cor. Ac. M.M.B.E.	...	Corrosive acetic and Mann's methyl-blue eosin.

FIGURES.

1. Mature ovary. Nat. size.
2. Germinal tissue with older oocytes. B. I. H. × 130
3. Syncitium and the earliest stages of the oocytes. B.I.H. × 325.
4. A young oocyte showing nucleolar extrusions inside the nucleus. Cor. Ac. M.M.B.E. × 650
5. Nuclear membrane showing granules of nucleolar matter sticking to the outside and inside. B.I.H. × 650
6. Very young oocytes showing circumnuclear mitochondrial ring and Golgi bodies at one pole. K.N. Unstained. × 650
7. Oocyte slightly older than the former. K.N. Unstained. × 650
8. Still more advanced Oocyte. K.N.I.H. × 325
9. Oocyte in which albuminous yolk formation has commenced. K.N. Unstained. × 325
10. Mitochondria highly magnified to show how they clump together and form albuminous yolk droplets. K.N. Unstained. × 1625
11. Older oocyte in which albuminous yolk is formed in all parts of the cytoplasm. Ch. K. × 325
12. Advanced oocyte. K.N. Unstained. × 325
13. Youngest oocytes with indistinguishable cell boundaries showing mitochondrial mass at one side of the nuclei. F.WA.I.H. × 650

14, 15, 16. Fresh oocytes showing the gradual enlargement of the Golgi bodies to become fatty yolk. × 325

17. Portion of a fresh oocyte, almost ripe, slightly pressed under coverglass. × 325
18. Young oocyte showing blackened and decolorised fat globules. Strong Flemming with acetic, unstained. × 325
19. Portion of an older oocyte in F.W.A.I.H. Preparation showing distorted Golgi bodies and blackened fat droplets. × 325

THE UNIVERSITY

THE HON'BLE SIR K. RAMUNNI MENON

On 21st May, the Hon'ble Sir Konkoth Ramunni Menon, *Kt.*, M. A. (Cantab.), retired from the Vice-Chancellorship of the University after holding that high office for six years. He has served the University in various capacities since 1912, and during this period of 22 years, he has taken an active part in the affairs of the University. The Journal may therefore be permitted on this occasion to publish a short sketch of his life and work.

Sir Ramunni Menon was born on 14th September 1872, at Villyadom near Trichur in the well-known Nair family of Konkoth. His father, Mr. Idichanadath Krishna Menon, was a cultured and able public servant of his time. He was the pet of his uncles who educated him, and after their death, he has admirably discharged the duties of the *karanavan* of that prosperous Tarwad. In 1899, he married Miss V. K. Kalliani Amma of Kurupath, one of the aristocratic families of Trichur.

Sir Ramunni Menon had a brilliant academic career. He received his early education at Trichur and Ernakulam, and at both places he distinguished himself as a student of unusual gifts. In 1893, he passed his B.A. from the Presidency College, topping the list of candidates in English and Zoology in the Presidency. He then obtained the Gilchrist Scholarship and proceeded to Christ's College, Cambridge, where he was subsequently elected to another scholarship—an unusual distinction for an Indian student, even in these days. He took a first class in both parts of the Tripos (in 1896 and 1897) and soon after returning to India, entered the Madras Education Department. In 1910, he became Professor of Zoology in the Presidency College, and he held that post till his retirement in 1927.

As Professor at the Presidency College, he built up an efficient Department of Zoology. He was a brilliant teacher and understood the difficulties of his students, and those who have had the privilege of attending his lectures will always remember with gratitude the great pains he took in making the subject interesting and instructive. A strong disciplinarian himself, his students soon learned to adjust themselves to the rather severe atmosphere of his lecture hall. Of him it may be truly said that he radiated discipline without actually

enforcing it. A keen and careful observer, he trained his students in habits of accurate and systematic work and thus fostered qualities which have stood many a young man in good stead in after life.

In 1928, he was appointed Vice-Chancellor of the University, and was reappointed again in 1931. Since the reorganisation of the Madras University in 1923, the duties of the Vice-Chancellor have become heavy and varied ; and in order to discharge them efficiently, not only academic eminence but great administrative ability and a capacity to master minute detail have become essential. It will be generally admitted that Sir Ramunni Menon brought to his task administrative ability of a high order, and as for his capacity for detail, it has become a by-word. The most important task during his term of office was the reorganisation of the University administration to meet the requirements of the Amendment Act of 1929, and he addressed himself to this task with great earnestness and unremitting industry. The statutes of the University were carefully overhauled, proper academic standards were prescribed for the affiliated colleges, and suitable arrangements were laid down for the housing and functioning of the newly established research departments of the University. He administered the laws of the University with great fairness and his dealings with the affiliated colleges were characterized by tact, impartiality and a real desire to maintain standards, both intellectual and moral. His greatest success was perhaps in the financial sphere. It was during his term of office, and largely under his initiative, that an adequate financial system was evolved for the University. He husbanded the resources of the University with great care, put his finger on every item of waste, and all avenues to economy were thoroughly explored and effectively utilized. Thanks to such a jealous guard of the purse, the finances of the Madras University are to-day in a prosperous condition, and all those who know University finances in these days, whether within India or outside, will recognize that this is a great achievement.

Perhaps the establishment of the Research Institutes of Zoology, Botany, and Bio-Chemistry will be regarded by future generations as his greatest achievement as Vice-Chancellor. He planned them long and well, and by the time he laid down the reins of office, the three Institutes were firmly founded.

Sir Ramunni Menon took great pains to foster social life in the University. He enthusiastically pushed through the scheme of a University Union, taking particular care that it should benefit the students of the Colleges in the City. The frequent entertainments that he organised at the Senate House not only brought together the teachers of the different Colleges, but also served as opportunities for the contact of academic people with persons engaged in other walks of life.

It is not sufficiently known that Sir Ramunni Menon is an ardent lover of art and literature. In the striking Convocation Address delivered by him in 1927, he emphasised the importance of the study of literature and throughout his career, he has used every opportunity to impress upon the people around him the value of general culture. He is the founder of the Stone Prize for English in the University and of the Bilderbeck Prize for the same subject in the Presidency College. He also instituted a prize for Sanskrit at Christ's College, Cambridge. Nor is his conception of culture a narrow one. He is a keen lover of pictures, and it may be remembered that the Faculty of Fine Arts and the Diploma in Music were established during his regime. He has instituted a Medal for fine arts in the Ernakulam College (which is awarded for Drawing and Music in alternate years), and just on the eve of his retirement from the Vice-Chancellorship, he founded a Lectureship in the University for the advancement of the study of aesthetics.

This is not perhaps the time to dwell on the sterling qualities that have contributed to his success, but this account cannot be complete without a bare reference to his great sincerity and equanimity, the austerity of his personal life, his hatred of sham and ostentation, and his ardent devotion to duty.

It remains for us only to wish him success in the new sphere of activity which he has entered upon. If the Council of State is to reflect the 'sober second thought of the Nation', it should contain persons of mellowed wisdom and sound judgement, persons who are capable of giving wise counsel on economic and constitutional questions, uninfluenced by political shibboleths and party interests. The Council of State has secured such a person in Sir Ramuni Menon, as already the Council debates have shown. May he live long in the service of King and Country!

UNIVERSITY NOTES

(January to July 1934)

Changes in Personnel

The term of office of the Vice-Chancellor, Sir K. Ramunni Menon, Kt., ceased by efflux of time on the 21st May 1934, and Mr. R. Littlehailes, C.I.E., M.A., one of three persons recommended by the Senate, was appointed Vice-Chancellor of the University for a term of three years from the 21st May, 1934.

During the period, 8th February to 20th May, when Sir K. Ramunni Menon was on leave, the Rev. F. Bertram, S.J., a member of the Syndicate, was appointed to officiate as Vice-Chancellor.

The following changes took place on the Syndicate:—

Mr. M. A. Candeth died on the 28th March 1934 and in this vacancy Mr. C. J. Varkey, Professor, St. Aloysius' College, Mangalore, was elected by the Senate.

Mr. Quadir Hussain ceased, by efflux of time, to be a member of the Syndicate from the 7th May 1934, and Mr. A. Gopala Menon, of Trivandrum, was elected to the Syndicate by the Academic Council.

Lt.-Col. C. Newcomb, I.M.S., resigned his nominated seat on the Syndicate in May, when he went on leave, and Lt.-Col R. E. Wright, C.I.E., I.M.S., Ag. Principal, Madras Medical College, was nominated by the Chancellor to the vacancy.

Courses of Study

Recommendations for revision of higher research degree courses and draft revised regulations for the Matriculation and Intermediate examinations which were placed before the Academic Council were referred back to the Syndicate for reconsideration and report with reference to certain details and directions given.

Regulations for the new B.Sc. (Veterinary) Degree course and examinations were adopted.

Teachers and Research Departments

The services of Dr. P. J. Thomas were lent to the Government of India as one of the two Indian Economic Experts appointed to work with Dr. Bowley and Mr. Robertson in connection with the Economic Survey. He was away on this duty from 2nd January to 31st March 1934.

Mr. P. S. Lokanathan, Reader in the Economics Department, who went on study leave to England in July last returned to duty in February 1934 after qualifying for the D.Sc., Degree of the London University, the thesis submitted by him for the degree being 'Industrial Organization in India.'

The proposal for the institution of a Department of Anthropology was approved by the Syndicate and the Academic Council and the details of the Scheme are now under consideration by the Board of Studies in the subject.

Mr. Sundararama Sastri, M.A., M.Sc. has been appointed to the vacant Lectureship in Statistics.

Publications

The following are the latest publications of the University :—

1. *The Challenge of the Temporal Process.—Principal Miller Lectures, 1933,* by Dr. A. G. Hogg.
2. *Vijianagara.—The Origin of the City and the Empire* by Dr. N. Venkataramanayya.
3. *The Unadi Sutras in various recensions.* Edited by Mr. T. R. Chintamani, Parts II. and VI.
4. *Brhati.*—Part I. Edited by S. K. Ramanatha Sastri.

Lectures

The following endowment lectures were delivered during the period :—

Principal Miller Lectureship. By Rev. John Mackenzie, Bombay, on 'Purpose and Progress.'

Dr. Elizabeth Mathai Lectureship. By Lt.-Col. R. E. Wright, C.I.E., I.M.S., on 'The Chief Preventible Blinding Diseases of Childhood'.

Mr. Ghulam Yazdani of Hyderabad who was appointed to deliver the Sir William Meyer Lectures for the year 1934 expressed his inability to do so and the Syndicate has appointed Mr. K. N. Dikshit to deliver the lectures in History next year.

Rao Bahadur K. V. Rangaswami Ayyangar, of Trivandrum, was appointed to deliver the Sir William Meyer Lectures in Economics for this year.

Endowments

The following new endowments were accepted by the Syndicate:—

(i) The Rt. Hon. Sir George Stanley Lectureship instituted by Diwan Bahadur Sir K. Ramunni Menon, *Kt.*, former Vice-Chancellor, in the name of the Rt. Hon. Sir George Stanley, Governor of Madras and Chancellor of the University, the subject of the lecture being Aesthetics to be delivered once in three years.

(ii) Dr. A. Lakshmanaswami Mudaliar Medal instituted by Diwan Bahadur Sir K. Ramunni Menon, *Kt.*, former Vice-Chancellor, in the name of Rao Bahadur Dr. A. Lakshmanaswami Mudaliar to be awarded to the candidate who qualifies for the degree of M.B., B.S., and gets the highest number of marks in Midwifery.

(iii) Mr. G. A. Natesan Prize instituted by his friends out of subscription received in connection with his *Srashtiabdapurti* (sixtieth birthday) ceremony. The Prize is to be awarded for proficiency in Indian Music either in B.A., or in the Diploma in Indian Music.

OBITUARY

THE LATE MR. M. A. CANDETH.

It is with deep regret that we have to record the death of Mr. M.A. Candeth, one of the most distinguished educationists of the day in Southern India. The spontaneous expressions of regret from his innumerable friends, acquaintances and old students give but a feeble indication of the loss that was so widely felt in the many spheres of activity with which he was associated. No one who had come into touch with the late Mr. Candeth

would have failed to realise what a dynamic personality he was, and how richly gifted he was, with some of the finest qualities of head and heart which people appreciate in any individual.

After a brilliant scholastic career, both here and abroad, he soon found himself in the robes of a teacher and here he had an opportunity to show to the fullest extent the depth of his learning, and the width of his tastes. To the students who had the good fortune to sit at his feet, and imbibe the great lessons of life which he was preaching in his homely style, he was not only the teacher in the class-room, but in reality a friend, philosopher and guide, whose sane advice amidst the many witty sarcasms he used to indulge in; was of permanent and abiding value. Mr. Candeth's intellectual vigour could not possibly keep him tied down to his desk or to the immediate group of students under his charge. He threw himself heart and soul in the wider spheres of activity connected with education in general and students in particular. As a member of various university bodies for several years, Mr. Candeth proved himself an invaluable leader of sound educational ideas and of high academic aims. It could be truly said of him as of Goldsmith that he touched nothing that he did not adorn. Whether in the boards of studies, or in the Academic Council, or in the Senate, his intervention in any debate was welcomed on all sides, because he had the rare gifts of clear thinking, of precise thought, lucid expression, persuasive eloquence, and sweet logic, so that even when he demolished the arguments of his opponent, he did it with such grace that there was little of heat or passion generated.

His work on the chief executive body, the Syndicate, was even more solid, if somewhat less spectcular, and his colleagues would bear testimony to the influence he wielded on all important matters of policy and administration. He was ever anxious to pursue the narrow path of duty, careless of the smiles and fearless of the frowns of the multitude, and was not one of those who dare not be in the right with two or three.

Mr. Candeth was a great patriot and his patriotism took the solid shape of some material contribution for the development of true citizenship. His name will ever be associated with the inception and progress of the Madras University Training Corps, and his influence for good was tremendous and well-known to all interested in the future of that body. He did not, however

allow his patroitism to be swayed by sentimentalism or warped by the passing phases of popular fancy, and had almost a contempt for those spectacular displays of evanescent frenzy which sometimes swayed large groups of adolescents and adults.

In society Mr. Candeth was always a centre of attraction. Endowed with brilliant conversational abilities, with a mind peculiarly agile and gifted with a wide knowledge of men and manners, he was well able by his vivacious wit and sparkling humor to enthrall any audience in a drawing room. And many are his friends who have come away from his company cheered and relieved and in a robust frame of mind.

Mr. Candeth had a great future before him. It was well-known that he would have risen to the highest rung of the ladder as an educationist and he was himself looking forward with real pleasure to the work that lay before him immediately as the Principal of one of the premier colleges in the Presidency. His death is a great loss to the educational world and we of the University are panticularly sorry that we have been deprived of such a wealth of talent. To the members of the bereaved family we extend our heartfelt sympathy. May his soul rest in peace.

A. L. M.

REVIEWS

THE MAHABHARATA, Southern Recension, critically edited by Vidyasagar P. P. S. SASTRI, Vol. IV, Aranya Parvan, Part I. V. Ramawsami Sastrulu & Sons, Esplanade, Madras.

Six volumes of this critical edition of the Southern Recension of the Mahabharata in eighteen volumes have already been published by Messrs. Ramaswami Sastrulu & Sons. The first part of Aranya Parvan comprising volumes IV and V, which was held over, has now been issued. A welcome feature in the get-up of this volume is the light coloured printed wrapper which protects the cover.

Dr. Sukthankar in his Bhandarkar Institute edition of the Mahabharata, while admitting the great value of Prof. Sastri's critical work has challenged his whole method of editing. In the introduction to this volume Prof. Sastri examines and refutes the criticism. As pointed out by Prof. Sastri, it would not be possible to examine *all* the manuscripts of the Southern Recension, and record *all* their variations. While such a method may be desirable in the case of other works, it would be neither practicable, nor profitable in the case of the Mahabharata. The best that could be done has been done by Prof. Sastri, namely, to choose which pass the tests of belonging to the Southern Recension, and adhere to them in the main, recording the departures therefrom scrupulously. We do not think that Dr. Sukthankar is justified in charging Prof. Sastri with arbitrariness in fixing the chapters 'in order to reach an imaginary norm.' Surely, the scheme in the Parvasangraha is not 'an imaginary norm', and it is entirely reasonable on Prof. Sastri's part to attempt a conjectural reconstruction of it, not in an arbitrary manner, but basing his division on one or other of the manuscripts available.

R. V.

BOOKS RECEIVED

Everyday Law for Women By Helena Normanton.
Trial of A. A. Rouse ,,
Trial of Norman Thorne ,,
India in England ,,
Kingship through the Ages By P. S. Ramakrishna Iyer.
Groundworks of Economics By R. D. Richards (*Tutorial Press*).

PERIODICALS

Journal of the University of Bombay.
Journal of the Annamalai University.
Calcutta Review.
Half-Yearly Journal of the Mysore University.
Madras Agricultural Journal.
Monthly Summary of the League of Nations.
The Nagpur Agricultural College Magazine.